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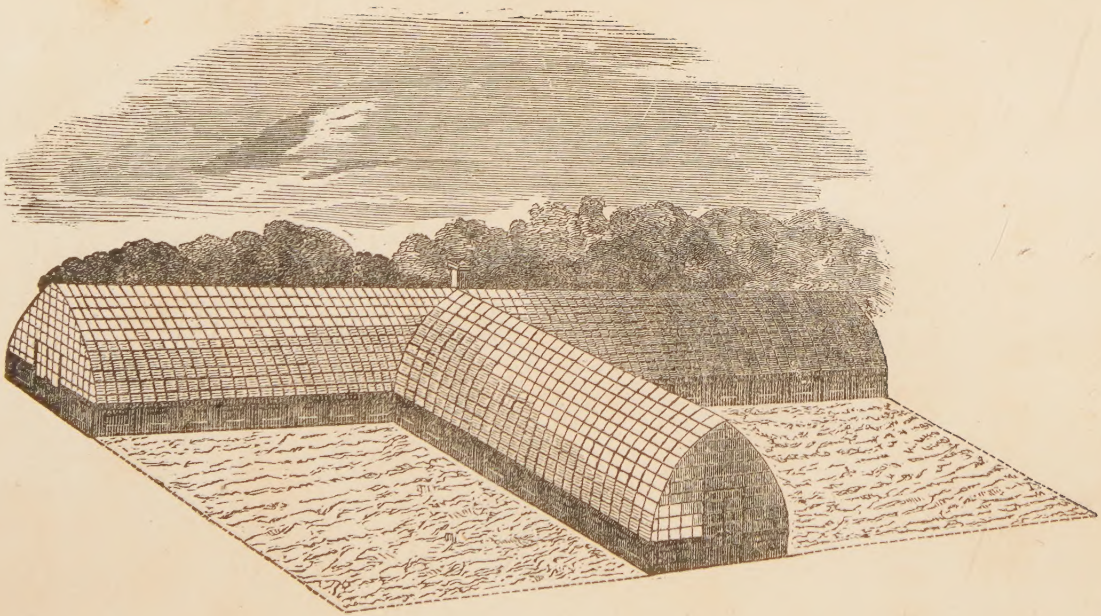

THE GRAPERY. Fig 1

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THE AMERICAN GRAPE GROWER'S GUIDE.

INTENDED ESPECIALLY FOR THE

American Climate.

BEING A PRACTICAL TREATISE ON THE CULTIVATION OF THE GRAPE-VINE IN EACH DEPARTMENT OF HOT HOUSE, COLD GRAPERY, RETARDING HOUSE, AND OUT DOOR CULTURE. WITH PLANS FOR THE CONSTRUCTION OF THE REQUISITE BUILDINGS, AND GIVING THE BEST METHODS OF HEATING THE SAME.

Ebery Department being fully Illustrated.

BY WILLIAM CHORLTON.
AUTHOR OF "THE COLD GRAPERY," ETC.

NEW YORK:
C. M. SAXTON & CO., AGRICULTURAL BOOK PUBLISHERS,
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CONTENTS.

CHAPTER I.

INTRODUCTORY REMARKS.

PAGE

Hardiness of natives and exotics 11
Effects of mildew and excessive changes 11
Cost of houses 12
Skill easily acquired 12
Botanists' distinctions 13
Circumstances favorable to development 14
Evils of dogma and prejudice 15
Acclimatizing 16
Gratification and advantage of the Grapery . . . 16

CHAPTER II.

HOUSES AND CONVENIENCES.

Double pitch, curve, and straight line 18
Single pitch 18
Ridge and furrow 18
Cold Grapery:
  Most suitable houses for 18
  Position for double pitch 19
  ———— single pitch 19
  Inclination of roof 20
  Explanation of Frontispiece 21
  Ground Plan to Frontispiece 22
  Calculations of profits 24
  House not to be used for other purposes . . . 26
  Foundations, ventilators, &c. 27
  Internal fixings, &c. 27
  Evil of cold water 28
  Situation 29
Early Grapery:
  Suitable designs for and remarks on 29
  Aspect 30

PAGE

Difficulties with outside temperature 30
Description and plan of house 31
Plan of ventilator 32
Advantage of inside planting 33
Plan of house heated by flue 34
Grapery for pot culture :
Plan of house for 35
Other houses suitable 36
Retarding House :
Objects of 36
Position and aspect 37
Plan of double detatched house 38
Mr. Webster's method of ventilation . . . 39

CHAPTER III.

ARTIFICIAL HEAT AND APPARATUS.

Reasons why it is required 40
Steam not suitable, and why 41
Hot water the best 41
Difference of material for pipes, &c. 42
Plan of boiler 43
Brick flues, general remarks on 44
Drying and parching effects of flues 45
Size and capacity of flue and furnace 46
Polmaise heating, remarks on 47
Plan of flue and polmaise combined 48

CHAPTER IV.

BORDERS, OR PREPARED BEDS.

Importance of right preparation 49
Bad effects of unsuitable materials 49
Nitrogenized manure not permanent 50
Good properties of bones and lime 52
Evil of over-deep borders 52
The strongest growth not the best 52
Advantages of well-drained borders 53
How to make the borders 53
Good drainage retains the moisture 54
Advantages of making only a part at first . . . 55
Too much stimulating matter not good 56

PAGE
Width of borders 56
How to retain natural longevity 57
Useless expenditure 58

CHAPTER V.

PLANTING AND MANAGEMENT THE FIRST YEAR.

Choosing of vines for planting 59
When to plant 59
How to plant 60
Careful watering required 61
Planting vines previously started into growth . . . 61
Management through the summer 62
Attention to the roots 62
Necessity of a warm temperature 63
Attention to the tops 64
Increase of air as ripening progresses 64
How to prune, &c. 64
Wash to kill insects 65
Covering for winter 65
Top-dressing of compost 66

CHAPTER VI.

MANAGEMENT FOR THE SECOND YEAR, AND PERMANENT TREATMENT FOR THE COLD GRAPERY.

Retarding of the buds 67
How to manage the advancing growth . . . 67
Reducing of bunches 68
Regulation of temperature 68
Fertilizing the flowers 69
Application of water after blossoming . . . 69
Further reduction of fruit 70
Thinning out the superfluous berries 71
Inside watering through the summer 72
Outside watering through the summer . . . 72
Application of liquid manure 73
A drier atmosphere and more air required later in the season 73
House to be closed on frosty nights 74
Fall management 74
Weight of fruit to be allowed 75

CHAPTER VII.

THE EARLY GRAPERY, OR FORCING HOUSE.

PAGE

Practical skill required, and remarks 77
Yearly forcing not injurious 79
Covering for outside borders 80
Injury from the roots being in a cold bed 80
Time to prune, and commencing to force 83
Evils of cold drafts of air 84
General treatment 85
Watering outside borders, and free ventilation . . . 86
Second early crop 87
Journal of temperature and remarks 88

CHAPTER VIII.

POT CULTURE.

Advantages, care required, &c. 91
Comparative difference in crop 92
How to economise space 93
Suitable vines, compost, and potting 93
General treatment 95
Management for second fruiting 96
Application of liquid manure 97

CHAPTER IX.

RETARDING HOUSE.

Objects of the Retarding House 98
General remarks, and treatment 98
Caution required in pruning 101
How long in the year grapes may be had 102

CHAPTER X.

LIST OF VARIETIES.

Remarks on the confusion of kinds 104
Exotics, descriptive list 105
Cold Grapery, the best kinds for 112
Forcing House 112
Retarding House 113

PAGE
Pot culture 113
Remarks on Muscats 114
Native Grapes, varieties of 115

CHAPTER XI.

PRUNING AND TRAINING.

General remarks 116
Double spur method 117
Single close spur method 119
Long rod " 120
Renewal " 121
Extension " 122
To produce temporary full crop 124
Longevity of the grape vine 125
Weight of fruit that a vine will produce . . . 125
Advantages of extension 126
Summer pruning 126
Evils of shortening in too close 128
Curtailing the plant's energy shortens life . . . 129

CHAPTER XII.

PROPAGATION AND THE RAISING OF NEW KINDS.

Propagation by eyes 131
——————— cuttings 132
——————— coiling 133
——————— layers 134
——————— layers suspended 134
——————— grafting 135
——————— inarching 137
——————— seed 138
The raising of new kinds 138
Improvement that may be made 139
National profits 140
Hybridizing, or cross-breeding 141

CHAPTER XIII.

DISEASES.

Mildew:
Different kinds, and first indication 143
Oidium, its appearance 143

PAGE
Time of appearance 144
Sulphur a remedy 145
Botrytis described 145
How fungoids vegetate 146
Kinds not injurious 148
Shrivel and shank :
General remarks 148
Various causes—how produced 149
How to prevent 150
Dry rot in the roots :
Indications 151
Other kinds of rot, and how to prevent . . . 151
Rot in the fruit :
The cause, and how to remedy 153
Spot :
The probable cause 154
Remarks on watering overhead 154

CHAPTER XIV.

INSECTS AND HOW TO DESTROY THEM.

Remarks and different kinds 156
Red spider, scaly and mealy bugs 157
Green and black fly, thrips, fretters, rose bug . . 158
Beetles, moths 159

CHAPTER XV.

THE VINEYARD AND OUT-DOOR CULTURE.

General remarks 161
Bad effects of damp air and undrained land . . . 162
Carbonate of lime, its good effects 163
Choice of situation 164
Preparing the land 165
Action of cold air 166
Formation of terraces 167
Trellises and supports 168
Planting and choosing plants 169
After-treatment 170
Training over arbors, &c. 171

PREFACE.

Owing to the favorable reception of my monograph, the Cold Grapery, by those who are interested in grape culture, and the commendations of intelligent practical cultivators of this luscious fruit, I have determined to comply with the request of friends, by giving a more comprehensive edition, with the hope that my humble efforts may be of service to the public.

What is recorded is simply an explanation of my own experience and observation, and an expression of my deliberately formed opinions. The method here given has been successful hitherto, and is founded upon the practice of the last quarter century. I have endeavored, as much as possible, to give a common-sense view of the whole routine, to embody every idea required in each department, and labored to make the detail concise, yet plain.

Such as it is, I submit it to a discerning and intelligent public, and shall be amply repaid for my trouble, if it shall hereafter be the means of extending a true knowledge, of the subject on which it treats.

William Chorlton.

New Brighton, Staten Island.

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CHAPTER I.

INTRODUCTORY REMARKS.

We find, from history, that the grape-vine has been one of the most esteemed and essential fruits from the most remote periods of antiquity. Its cultivation has followed the migrations of civilized man into all climes suitable to its prosperity, and, since the erection of glass houses has been understood, has become adopted into many countries where it otherwise could not succeed.

In the United States, the different varieties of the native, *Vitis Labrusca*, as Isabella, &c., and those of the native *Vitis vulpina*, as Scuppernong, &c., with ordinary treatment, flourish, and ripen their fruit in the open air; while those of the exotic, *Vitis vinifera*, as Chasselas, Hamburgh, &c., have, excepting in a few solitary instances, proved a complete failure, from their tendency to become mildewed. In most parts of the Union, there is sufficient light and heat to bring the different varieties of the latter species to maturity, and they are hardy enough to resist the cold, but unfortunately, when the disease (allow the expression) attacks them, the free action of growth is checked, the energy is impaired, and instead of well-hardened wood, there is nothing but an unripened, sappy substance, to withstand the severe winters. The fruit also is rendered worthless from the same cause; and although many attempts have been tried, with the most sanguine expectations, they have been as often abandoned.

This evil is the result of the growth of fungoid vegeta-

tion, the development of which is accelerated by the excessive changes from dry to moist, from heat to cold, and *vice versa.* Fortunately, the erection of glass houses is now so well understood, and material is so cheap, that we have a ready antidote; for, by planting inside these structures, we are enabled to equalize the temperature and overcome the difficulty. There is also the advantage, if we take the whole range of the subject, of being able to cut ripe grapes nearly the whole year round; and even as a general crop in the cold grapery, with a proper selection of sorts, a supply may be obtained from the middle of July, or the beginning of August (according to locality), on to near the end of December.

Generally it has been thought that the cultivation of this desirable fruit was prohibited to all but the most wealthy, on account of expense, and peculiarly mysteterious skill. As to the first difficulty, good and suitable houses can be erected, when heating apparatus is not attached, at from $8 to $14 per running foot, on the length of the house, with all conveniences included, and proper fertilizing materials are no great expense; so that this obstacle can be removed even by those of humble means. In making the above assertion as to cost, it is not presumed that the lesser amount will complete a stately building, but a snug and well adapted small house, such as many would like, can be finished for that amount; and the greater sum will furnish a profit to the builder, on a structure sufficiently elegant and commodious to gratify the most wealthy or fastidious. With regard to the skill, if the directions hereafter laid down (with a little observation added) be acted upon, a sufficiency of practical knowledge will soon be acquired; for these directions are the result of the author's experience, and are only what have been and are still being actually

accomplished by good grape-growers. Many have been prevented from commencing by seeing the many failures that have occurred, the small number of successful cases, and the hitherto almost general "say," that it is absolutely necessary in all cases to have fire heat. But we are dawning upon a new era in these respects, and the alacrity and determined enthusiasm with which many have now come into, and others who are beginning to enter the field, will go far towards dispelling these fears, and will eventually drive out prejudice. No fruit-bearing plant will give greater satisfaction than the grape-vine, and nothing *horticultural* will continue to prosper without it. All that is wanted are a few right ideas, and the writer has done his best to discharge his duty, feeling convinced that ere long the grape-house will be considered as necessary an adjunct to an estate, however small, as at present is a peach-orchard.

Botanists disagree with respect to the classifying of the genus *vitis*, some making the species very numerous, and others only dividing it into well-marked specialities, thereby simplifying and rendering the differences more distinct. There are some men so fond of dividing and subdividing nature's distinctions according to their own fickle whims and fancies, that, were we always to follow them, it would take a lifetime to BEGIN to understand their abstract connections; and as these individuals have in many cases become authors, and consequently are referred to as authority, there is some apology for the novice wandering in the maze of misunderstanding which they have to some extent established. Such men ought to take a course of practical lessons in hybridization, and see the results, before publishing their manuscripts, when they would discover that many of their so-called species are no more distinct than some of the varieties which may be artifi-

cially produced. However, this has little to do with us in the present subject, further than the understanding of the difference between our natives and the exotics, and here it would appear that the constitutional properties alone are sufficient to make a true natural division; for, unless we are greatly mistaken, there has not been one variety of foreign origin, or yet a seedling, direct from the same source, which can be *truly* verified as withstanding the changes of our climate, with the same pertinacity as the natives.

The exotic grape-vine is a native of, and flourishes the best in warm, even, and comparatively dry climates; its organization is such as to require a long, steady, and warm season to perfect its growth. Under favorable circumstances, it pushes forth a vigorous development, and absorbs a large quantity of nutriment from the soil, if encouraged to the full extent of its powers. The broad and ample foliage perspires and respires very freely. Hence it follows, that the atmosphere in which it is growing should be most particularly adapted to the various stages of growth. Practical experience shows this to be decidedly the case; for, when not attended to, the most injurious consequences follow.

Heat is the cause by which the sap is set in motion in the spring, and when it is once excited, the action is gradually increased along with the rising temperature, until eventually the whole energies of the plant are brought into active play. Light and moisture, combined with heat, are essential to its welfare; they encourage this action, and enable the plant to develop and mature its growth to its fullest capacity. This being the case, it is easy to see that in so vigorous a grower as the grape-vine a great amount of these three elements is required. This I would most particularly impress upon all grape-growers.

Heat, light, and moisture are the main requisites; yet these elements are generally too sparingly administered, although the grape-vine requires them all in abundance while growing freely.

It would be well if all cultivators were to study more closely the laws by which the vegetable world is governed; were it so there would be fewer failures. We are attached too much to set notions, and follow the blind practice of prejudice oftener than we ought; and if we add to this the great number of pretenders who swarm over the country, there is no occasion to wonder at the many failures. Let it not be thought that I wish to depreciate the character of the skilful horticulturist, for we have many men who are an honor to the calling,—well qualified to give advice, and under whose care the grape vine is as well managed as in any part of Europe; but while wishing to do all in our power to uphold the profession, we should raise our voice against those egotistical empirics who often deceive the unwary, waste the property of those who employ them, and bring ruin to many a horticultural establishment. In no department is this more often seen than in the grapery, where the weak growth, the ill-fed papery leaves, and spare fruit tell a woful tale of mismanagement. Yet no fruit-bearing plant, yields more readily to the wishes of the cultivator, or will bear more illtreatment than the grape, and if other fruits had to be managed as artificially as this requires to be under glass, there would be in them more failures, than it is subject to under inexperienced hands.

Although there is much skill required in the cultivation of this fruit in all its bearings, there are none of those superannuated nostrums, or mysterious dogmas required, that these quacks prate about, and the necessary knowledge is readily acquired. The main secrets are, to under-

stand the constitutional habits, and adapt our treatment accordingly. Now, if we take into consideration, as stated above, that the exotic grape-vine is indigenous to, and flourishes best in those countries which have long and steady summers, and that those same localities are comparatively dry during the periods of rest, it seems only reasonable that we should keep up a warm and equable temperature during growth, and also have the roots in a well-drained, or naturally dry substratum,—so far for its natural requirements. All that we have so far done, by attempting to acclimatize the grape, has not yet overcome these physical difficulties, neither will any future attempts succeed, *unless we get a race of seedlings, crossed with the native varieties, and raised in our own climate.* By encouraging vigorous development, by a moist atmosphere, added to this required steady heat, and afterwards concentrating the collected juices by a further continuance of the latter principle, with air more freely admitted until the approach of maturity, afterwards reducing the temperature, and moisture as ripening progresses, it will bend to the will of the most fastidious enthusiast.

By the aid of glass houses, either with or without artificial heat, all this can be accomplished, and as they can be erected of any size to suit the pecuniary means, or caprice of different persons, a grapery is within the reach of a poor man. How gratifying would it be to the mechanic, and small tradesman, to have attached to his homestead a small house of grapes,—what an appendage to his little domain, and with what exulting feelings would he view his crop as "he sat under his own vine," and watched with an enthusiastic pleasure the several stages of bursting buds, flowers, and fruit, knowing that he could enjoy his own luscious grapes, equal in quality with those of the most wealthy proprietor in the land, or the great-

est nabob in aristocratic Europe. This pleasure may be enjoyed by most persons. Half the money that is often spent in "gingerbread" decorations, miscalled ornaments around a dwelling-house, would erect a little grapery, which in many places might be attached to, or cover one end of the building, having a door leading into it from the house: and let not the wife or daughters think the necessary attentions required during the absence of the "gude man," to be a degrading pursuit, for it is no mean occupation. Woman never yet lowered herself by being seen in the garden, or by obtaining a knowledge of plants, and rural affairs, and it is surely far better to be employed in healthful exercise, such as is here furnished, than to be lolling from morn to night, inanimate, as it were, upon the downy sofa, reading exciting and voluptuous novels, and assisting the seeds of consumption to germinate. Would that we could induce our accomplished matrons, and fair belles to take a more active part in the operations of horticulture. Why should these departments be considered too masculine for woman's position in society?

CHAPTER II.

HOUSES AND CONVENIENCES.

THERE has been from time to time, much controversy respecting the various kinds of structures which are most suitable, for cultivating the grape vine. Some advocate the curved line, double pitch; others again, the straight line, double pitch. Some, from a preference for old notions, think none so suitable as the common lean-to, while a few who have advanced a step out of this position, will admit instead of the common plane lean-to, a roof with a curved line. Latterly a new notion has sprung up, and we find the ridge-and-furrow-formed roof is gaining an ascendancy.

In order to make this part more easily understood, it is divided into the Cold Grapery, or growing without artificial heat; Forcing House, Forcing House for Pot Culture, and Retarding House.

COLD GRAPERY.—The *form* of the house for this purpose is not so material, as the having it so constructed, that it may be shut up tight in cases of emergency. With this precaution, good glass, and good management, any style will answer the purpose; consequently the building may be erected to suit almost any fanciful design which the architect may choose, providing there is convenience for training the vines properly, and at a suitable distance from the glass; and if thought proper the whole surface may be of glass, for while this house is being worked, there is not much cold weather to contend with,

nothing more than can be guarded against by closing up. If there is any preference for general utility, the curve line double pitch ought to be chosen, as from the convex surface which is exposed to the sun's rays, at whatever altitude he may be, the intense heat is somewhat scattered, there is less danger of the leaves being scorched, and the light is also more equally distributed; this form is also generally considered the most agreeable to the eye.

Whatever style of double pitch be adopted, the ends ought to face north and south, or as near these points as may be convenient,—although a few degrees, variation either way is not of much consequence. By placing the house in this position, both sides receive the influence of the sun equally; besides in the middle of the day, when his rays are most intense, they are partly warded off by striking obliquely upon the sash-bars above, which on the whole length of the house, acts as a considerable shade.

In some cases, it may be desirable to cover a dead wall or side of a building; or it may be requisite that the cold grapery should be connected with a line of early forcing, or plant houses, when the lean-to roof will be most convenient, but there is no other advantage in adopting it, for with a double pitch, having two rows of pillars inside, one on each side of the central pathway, both sides may be planted, thus accommodating a double quantity of vines; besides there is no back wall seen, and it shows better taste in the proprietor. Where the avoiding of expense is an object it is also the cheapest, considering the number of plants provided for. Where the lean-to is adopted, the south-east, or south-west aspect is best, though full south is not objectionable, and grapes may be well ripened when the house faces due east or west. Further north than these two points cannot be considered suitable. In case it may be wished that the Cold Grapery

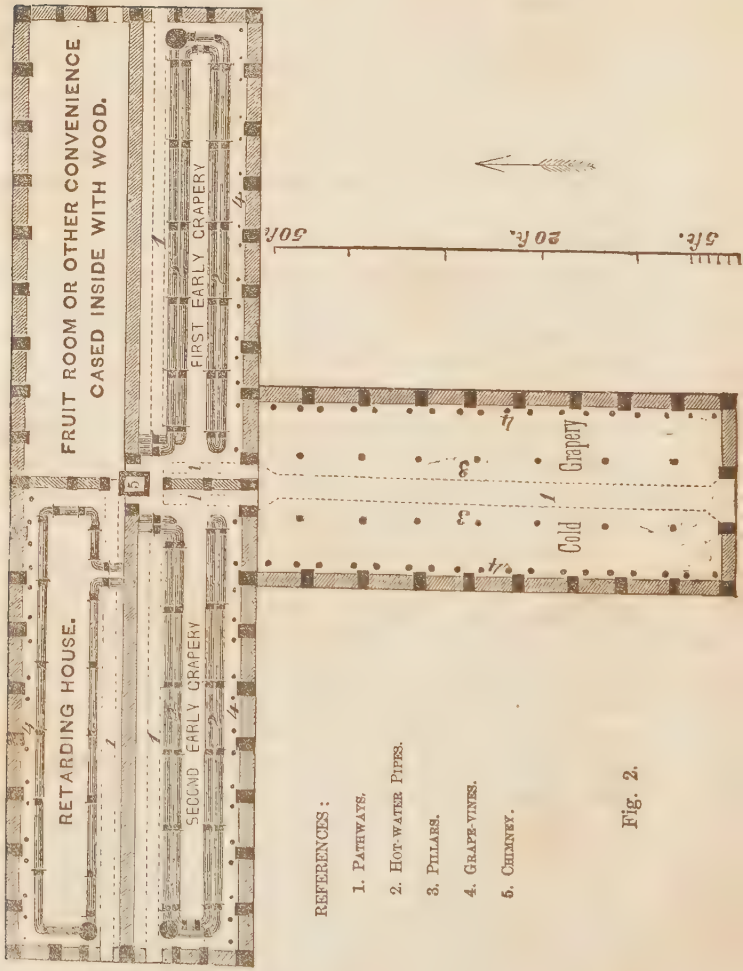
should correspond with some peculiar style of architecture in the dwelling-house, or other contiguous buildings (and these points ought often to be considered), the ridge and-furrow roof offers the greatest facilities, as it may be adapted to almost any form, without destroying its efficiency, for the vines can be trained horizontally under the roof; the grapes also look very handsome in this position as they hang perpendicularly down from the whole surface above. The canes in this case may be conducted along the under surface of each furrow, and the side spurs fixed at right angles, which enables the operator to arrange the bunches with the nicest regularity.

With respect to the inclination of the roof, it is desirable that it be not less than 45,° for the following reasons: our almost vertical sun at midsummer, when there is the greatest danger of scorching, will, at mid-day, strike the glass at an oblique angle, thus lessening its intensity and to a certain extent counteracting the evil. The glass being more upright, the wind or draft admitted through the laps, will be somewhat intercepted, and confined more immediately to the inner surface of the roof, which will ensure a more equable temperature around the leaves and stems, preventing somewhat the tendency to mildew. A steep roof also gives an additional length of rafter on a given width of house, which is an advantage, as the vines with the general modes of training, have more extent to develop their energies, and produce individually greater crops.

The frontispiece to this work is designed for the purpose of showing a comple arrangement of the grapery to suit all purposes, and at the same time to form a beautiful architectural structure. Allowing the Cold Grapery to be fifty feet long by twenty feet wide, and the others collectively to be one hundred feet long by twenty-five feet

wide, the whole could be finished and every convenience included for about $2500. The main front is shown in the ground plan, Fig 2, to face full south. In such case it will be understood that the Retarding House would have a due north aspect, which is somewhat a disadvantage, as the sun would have little effect upon it. In order to remedy this, one-third in depth of the upper part of the central longitudinal division wall might be of glass, which would allow a considerable portion of light to pass through from the southern side, and thereby obviate the evil. Such a contrivance is now under the charge of the writer in a house for flowering plants, and answers admirably. There is, however, no objection, where circumstances will permit of choice in location, to the placing of the front aspect a few degrees east of south, which would in an equal ratio turn the northern side towards the west, indeed all things considered it would be as well for all requirements. If a Retarding House be not wanted, the northern side might be converted into a neatly finished row of convenience rooms, or if this were objected to, it would make as fine a house for apricots, camellias, oranges, or such like, as could be desired. It is intended by the plan to fix the heating apparatus in a cellar beneath the northern division, and the boilers or furnaces near each other and adjacent to the chimney, each flue being conducted into the main outlet as shown in Fig. 10. If the cellar were rejected, the north-east portion might be employed for the same purpose; but in the former case all nuisance is prevented, and the whole building would be composed of a surface of glass, from the wall plates to the ridges.

Fig. 3 shows an interior view of a Cold Grapery, now under the writer's charge, which is 74 feet long, 20 feet wide, and 14 feet high, from the base level; there is a cistern sunk beneath near the centre, 12 feet deep by 12



REFERENCES:

1. Pathways.
2. Hot-water Pipes.
3. Pillars.
4. Grape-vines.
5. Chimney.

Fig. 2.

feet wide, and a force pump, hose, and tank for tempered water. The house rests upon strong cedar posts, and the borders are 20 feet wide each, outside; the inside likewise is prepared in the same manner, which gives an extent of 60 feet extreme breadth. For proportions and

Fig. 3.

Inside View of the Cold Grapery of J. C. Green, Esq., Staten Island.

style, this house is considered, by most persons who have seen it, to be satisfactory in every respect. The vines were planted in March, 1850, and there has been the following number of bunches, of good quality, cut in the respective years mentioned below:

1851, . . .	262	bunches
1852, ...	618	"
1853, . . .	918	"
1854, ...	1147	"
Making a total of .	2945	"

There is nothing extraordinary in the above produce, more than others may accomplish; it is only an average of what proper management and attention will do, and is more particularly introduced, as an answer to the oft repeated question, "will it pay?" The average weight of these respective crops, if taken collectively, would be one pound per bunch, all of which might have been sold at wholesale for fifty to seventy-five cents per lb. The following calculation of expenses, which is as correctly stated as can be, will show the balance of profits:

2945 lbs at 50 cts. . . .		$1472 50
Deduct labor 1st year. . .	$50 00	
" " 2d " . . .	100 00	
" " 3rd " . . .	150 00	
" " 4th ", . . .	200 00	
" " 5th " . . .	225 00	
Yearly dressings, $20. . . .	100 00	
Repairs, painting, &c., . . .	200 00	1025 00
		$447 50

By the above example it will be seen, that there is $447 above the lowest wholesale market prices and as the house, borders, &c., cost about $2000, it leaves a surplus profit of 4½ per cent. per annum, upon invested capital, which in the present position looks somewhat low, but it must be considered, that in this case, profit was not the object, everything was done, regardless of expense, to make a good and fine looking structure; the best French crystal glass was used, and all labor paid by the day, besides, in the first year there is no return profit, and the last season is the only one, in which a full crop has been taken; take into consideration too, that the labor account for after management is reckoned at $2 per day, and it will readily be seen, that a good and suitable house may

be built and tended so as to give a large return of profit. A house of equal dimensions, and well finished can be erected at $12 per lineal foot, with the exception of cistern, force pump, hose, and tank; and if we make an estimate of all incidental expenses on a house equal to the above, and 50 feet long, it will stand thus:

House finished with two coats of paint, 50 feet long at $12.00 , . .	$600 00
Brick cistern, cemented, 10 ft. by 10 ft. .	70 00
Tank, Force Pump, and Hose. . .	90 00
25 tons manure for borders at $2. . .	50 00
Material for drainage. . . .	20 00
90 bushels bones, at 50 cts. . .	45 00
100 do. charcoal, &c. . . .	15 00
Labor making borders, &c. . . .	20 00
48 vines, at 50 cts, ...	24 00
	$934 00

The comparative weight of fruit that may be taken from the latter will be about two-thirds, or 1964 lbs. at the same prices, making the total value for the five years of $982, and allowing the labor, expenses, &c., to be the same comparatively in both cases, we may put down $298 gain upon a capital of $934, which shows a profit of about six per cent. per annum, and this too at the commencement. If we were to reckon upon after years, when the vines, would bear regularly full crops; it will readily be seen that the profits would be much greater, and that with good management, there is no loss in having a *Cold Grapery* even though partial failures may occur.

When the grape-vine is to be grown to the greatest perfection, the house ought not to be applied to any other purpose. It appears, at first thought very reasonable to suppose, that for a general or summer crop of grapes, the

house may serve as a winter conservatory for flowering plants, but experience shows, that however late the vines may be kept back in the Spring, the buds will burst before the weather is suitably mild to turn the plants out, and into the open air; and at this time the vines will require a temperature peculiar to themselves, which would generally be too damp and close for the plants, many of which at the time, will be in a blooming state, requiring more air and a cooler atmosphere, than will be suitable for the vines; besides it is almost impossible to keep down insects in a house where plants are kept. There is some excuse in an early forced grapery, which is so congenial to the well being of some natives of the tropics, but as a general greenhouse requires heating and the cold grapery does not, the expense of two houses is not so great, compared with the advantage to be gained; therefore if possible, it is much better to have two houses where both are wanted. If pecuniary benefit be an object it is also more profitable, for the grape if well dealt by, will be honest in return, and pay a large per-centage upon capital, independently of ordinary expenses of labor, &c., but when neglected the reverse is the case.

In order to give free range to the roots it is advisable to erect the house upon stone pillars, or locust, or cedar posts, (each of which ought to be directly beneath a rafter,) which will allow them free egress to the outside borders.

There are several ways by which these houses may be ventilated, perhaps the most convenient is to admit air at the top, and near the bottom, or under the wall plate. The lower opening ought to be made so as to shut very tight, as the admission of cold drafts from below has a tendency to reduce the heat in the lower base of the house —the very part which, if possible, ought to be the warmest. Nature here teaches us a lesson, and it would be well

if we always gave ear to her instructions—the sun's rays strike the earth, and produce the greatest heat at the surface. She has no *fixed* confining canopy over the plants under her charge to prevent the heat from passing upward, and if we are obliged to have such, we ought not to render our necessities more unnatural than there is occasion for. Keep the head cool and the feet warm, is advice often given by our physicians, and the same rule applies to plants generally, with very slight modifications.

If the roof be made with sashes to slide over each other, which is the method best adapted for removal of the house at any future time, the upper ones will become the top ventilators; but when it is fixed, and composed of a continuous row of sash bars over supporting rafters underneath, the openings require to be lifted up from the bottom, and hung on the opposite end by hinges, or suspended by the middle on each side, and opened on a pivot. When hung by hinges the sides may rest upon the rafters, and the lower end project a little over the next squares of glass, thereby making it proof against drip, and this is perhaps the best plan, for beside being safer against rain, air can be admitted and the temperature lowered, without cold draughts striking down into the house. If hung from the sides there are no effectual means of capping, and however good the joints may be, the rain will find its way through more or less in time of violent storms.

The internal fixings required, are wires to support the vines, a tank to hold water while being tempered in the house, a hose with a pipe attached to distribute the water, and a force-pump to supply the hose. The wires are most convenient when placed parallel with the sash-bars, and about fifteen inches below the glass, which will be sufficient to clear the leaves from contact; if less space is allowed, the foliage of vigorous vines will touch

the roof, and are more exposed to the changes of temperature, their action also will be impeded by being cramped, but a greater distance than is actually required is objectionable, as the nearer the glass the better.

For a large house, a tank that will hold about two hundred gallons will be requisite, and for a smaller house, one in proportion. This tank during the earlier growing season ought to be kept full of water, so that when used it may be of the same temperature as the inside of the house. *Cold water applied immediately from an underground cistern, or well, suddenly checks the action of all plants,* and ought by all means to be guarded against. The force-pump may be attached to the tank, and if an air-tight metal globe be fixed over the discharge pipe, on the same principle as a fire engine, a steady stream will be propelled through the hose. By having two faucets on the lower pipes, one leading to the tank, and the other from the cistern below, there is no need for two pumps, as they may be shut, and opened, so as to answer the double purpose of drawing water from the cistern, or distributing it from the tank over the house. For a small grapery where economy is an object, a common syringe may be used instead of the hose, but in a large house the force-pump is more economical, and has the advantage of enabling the operator to drive the water well into the crevices of the wood-work, which greatly assists in keeping clear of insects.

If there is not a good supply of soft water close at hand, it is desirable to have a cistern sunk under or immediately near the house, and the water conveyed into it from the roof by gutters and pipe, which saves much labor, beside the benefit of always having rain water, which is the best for all plants.

The situation of the Cold Grapery is a matter of import-

ance, and in making arrangements ought not to be lost sight of. It should be freely exposed to light and air on all sides, if possible, away from the shade of trees or surrounding buildings, and if sheltered on the north, east, and west, so much the better; but it is best for this to be a sufficient distance, so as to secure a free action of the air around. Shelter is not indispensably necessary, but if practicable, is of use, as it assists in warding off the cold winds, which often prevail until late in spring, and after the vines have begun to grow.

The Early Grapery.—When the grape is produced as an earlier crop than the cold grapery will furnish, we have to resort to artificial heat, and with our ever variable climate, particularly during the frigid blasts of the latter part of winter, it becomes requisite, that we should have a tight and well protected house to work with; so that variety of design has in this case to succumb to circumstances. When a warm temperature has to be kept up by means of fuel, economy ought to be a prominent feature; and further, it is indispensable that a wholesome and growing atmosphere be maintained, which cannot be the case unless there is a command of genial moisture during the earlier stages of growth; both these requirements are best secured by close built structures, in which there is as little cubic bulk of air to be heated as may be consistent with sufficient convenience. It will be readily understood from this that, the different forms of curvilinear and plane lean-to roofs are the best, the wall plate upon which the lower ends of the rafters rest, being only a short distance above the ground level. Where there is nothing to interfere with choice, the curve line is preferable, so far as beauty, and the equalizing of the sun's rays is concerned, but there may be a set-off against this form, from the greater surface of glass, which may be thought to

conduct the applied heat away with a more than equal ratio. Balancing all points, what is gained by one, is lost in the other, and both are equally suitable.

With regard to aspect, full south is the best, where convenience will allow. South, south-east, is sometimes recommended, but, although with care, it answers well enough, there are the following objections. It often happens, that the most severe cold, or lowest grade of the thermometer outside, is immediately before, or at the time of sunrise, on the clearest mornings, and the heating apparatus must not be allowed to cool down; now as the sun rises direct, or nearly perpendicular from the horizon, the rays strike (with this aspect) very quickly upon the plane of the roof, which in conjunction with the internal action, suddenly raises the temperature, at the time when the extreme cold, and often severe winds, will not admit of air being given, consequently there is danger from the quick transition unless the greatest caution be exercised. If the house face full south, the sun at this time will strike more obliquely on the end, which will to some extent counteract the evil, and there is also an advantage in having greater natural warmth later on in the evening.

The following cross section, and ground plan, figs. 4 and 5, and description of an Early Grapery, now in care of and erected under the supervision of the writer, and which has answered every expectation, may be of service here, and will illustrate our own practical ideas on the subject. The dotted outline shows a house, which, in this example is devoted to the growth of Camellias, and, being fixed in this position does away with the necessity of a shed, and assists in keeping the grapery from exposure. The same arrangement will apply where there is a building already erected, and which, would become the back wall of the intended house.

In this case the house faces south, south-east (owing to convenience), with a slope on the roof of 40°, it is 78 feet long, by 13 feet wide, 2 feet high in front from the ground

Fig. 4.

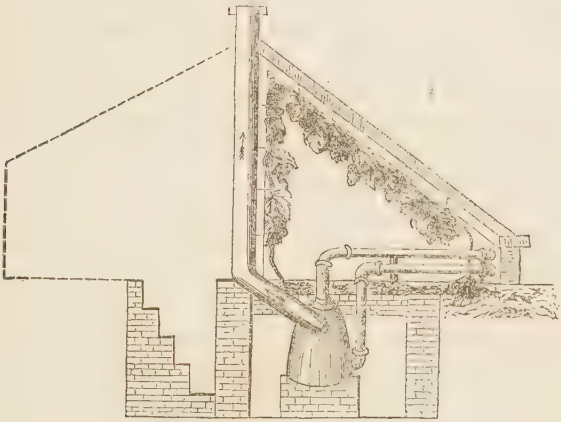
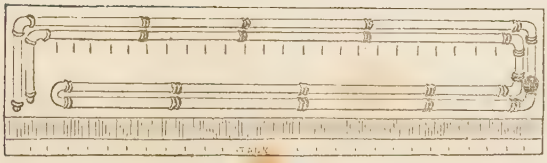


Fig. 5.



level, and 14 feet at the back. The foundation posts are Red Cedar, placed six feet apart, and sunk four feet in the ground, with the upper or exposed part, dressed off square, and cut at the top so as to form an even horizontal line; upon these the wall-plate is fixed, and made firm by being let in about an inch, the lower end of the rafters, which are six feet asunder, and the sash bars are socketed

into the wall-plate, and it is made sufficiently wide to allow of five inches projection on the outside, this part is scooped out on the upper side, and becomes the gutter, by which the water is conveyed to the cistern pipe; beside this there are cross bars every four feet on the length of the rafters, that stay and make the sash bars firm; ventilation is obtained by slides in the front wood work, immediately beneath the wall plate, and by sashes 2 feet six inches long and the same width, fitted by hinges at the ridge pole, these are lifted by a three-eights iron rod, having a hook at the upper end which is slipped through a hole in a small plate affixed to the middle of the lower end of each sash; the rod is steadied by being passed through two apertures at the end of a shaft three inches long that is welded, each into a small plate, and this screwed to the back side of the house; one about nine feet, and the other five feet from the ground. In the front of the lower hole is a screw worm, and a thumb screw to fit, which on being turned either way liberates or fastens the bar, and the sash is kept firm at any desired height.

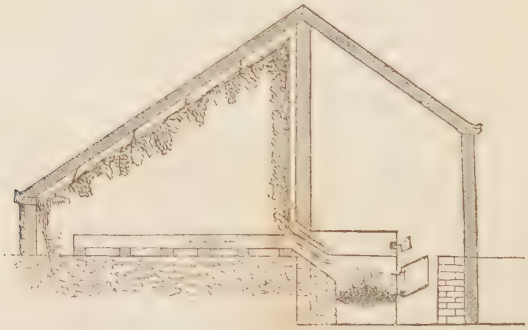
Fig. 6.

Fig. 6, shows the sash open This simple contrivance, costs very little, is effective, has the advantage of never

getting out of repair, and is as permanent as the house itself. It will be understood that this style of building glass houses, is simply a frame work covered with glass, without any double sash, and consequently there is no use for any additional portion of the rafter above the sash bars (as is the case where the sashes are made to slide), which is a decided improvement in appearance, and equally suitable. The house is heated by one of Hitchins' of New York middle sized boilers, and there is a lineal measure of 340 feet of four inch pipe employed, giving a double row of flow and return, beside the necessary appendages. One row is fixed close along the front, and the other at a distance of seven feet nearer to the back, which leaves room for a pathway, without any dip in the pipe, and there is the additional advantage of having all the heat arising from the front, and lower part of the house, thereby securing as much as possible, an equal temperature over all parts. There are two rows of vines planted, one to the back wall, and the other about a foot nearer to the middle of the house than the front row of pipes, which makes a distance of eighteen inches from the extreme front; the lower part of each of the roof vines is curved towards the bottom of the rafters, and consequently project partly over, but are some distance above the pipes, and to prevent injury from the heat when the apparatus is at work, there is affixed behind each, a short board, about ten inches wide, which protects the stem most effectually. The object of this arrangement was to insure warmth in front, and more particulary the lower part, and at the same time with the vines planted inside. It is a plan which we have not seen elsewhere adopted, and was conceived from a knowledge of its being somewhat in accordance with natural requirements; so far it has fulfilled all that was predicted, and what answers in our own practice, may be justifiably

recorded, even though it should conflict with the notions of others. As to planting an exotic grape vine outside of the house, so long as the roots have free egress, or exposing the stem to the vicissitudes of climate, such as we have in this country; we never yet saw the argument, often though it has been attempted, and as often eloquently advocated, that could bring conviction, as to its being philosophical, or reasonable. In nature, we find the heat greatest near the ground, from the fact of the atmosphere being compressed, and the reflection, which take places by the sun's rays striking the surface; and although we know that the stems of some plants are injured by his direct action upon them in hot weather, they are seldom affected by the same temperature if kept in the shade. This is the only explanation that will allow any amount of advocacy in the present instance, and it stands to reason that it serves little purpose.

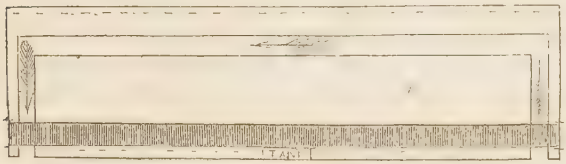
Fig. 7.



Figs. 7 and 8 will explain how a suitable structure may be adapted by a brick flue and furnace, with a shed attached, and it is preferable that it should extend the whole length on account of the shelter. As the flue will occupy more room than hot water-pipes, it is advisable to

plant the vines close to the inside front; and in making calculations, the entrance to the house should be elevated so that the pathway may pass over the top of the flue,

Fig. 8.



without which it will always be troublesome when walking through the house. This only requires a little ingenuity in each individual case, according as the details of arrangement may suit the particular circumstance.

Grapery for Pot Culture.—If a house were to be erected purposely for pot-culture, the most suitable and economical would be as shown in fig. 9; the inside floor-

Fig. 9.

ing sunk a foot being below the ground level, and the under base well drained around the outside foundation, to prevent cold moisture from penetrating laterally,

and if the heating apparatus be fixed around the inside, near to the walls, there will be an equal distribution over all parts. Such a house, if only ten feet wide, would accommodate three rows of vines, and leave room, for a pathway; one row being placed near to the back with the path next, and the other two nearer the front. With this arrangement, there would be no occasion to elevate the roof more than to give sufficient headway, as the path would be directly under the ridge,—say six feet above ground, and seven feet from the inside level, by which the exposure to cold, and severe winds is considerably avoided, and a steady heat maintained with much saving of fuel. There may be some objection to the short back lights, which should be of glass, but as these may be readily covered by shutters at night, and in severe dull weather the evil is less than the common form of lean-to, which has to be elevated according to the width of the house, and inclination of the roof. It is only for pot culture that this will become serviceable in grape growing, but for the purpose named, it is most suitable, can be erected cheap, and is a compact and easily-managed structure. Where the house is already built, or it may be inconvenient to adopt the above plan, on account of otherwise general arrangement, an ordinary lean-to, and more particularly the curve line will answer the purpose to almost equal advantage, and the design is only given as the best adapted, where the intention is to be as perfect as possible.

The Retarding House.—As the object of the retarding house is to have grapes beyond the time when the Cold Grapery, or least forwarded house will furnish them, it ought to be so situated as to assist in checking the early growth of the vines, it is also desirable that it should be capable of being rendered thoroughly dry inside, and like-

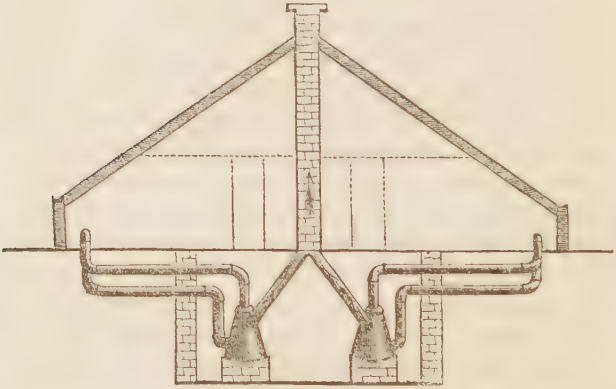
wise erected on a plan, by which it may be readily and economically heated, or rather that the applied heat may not be wasted, consequently, a lean-to form offers the greatest facilities as regards the latter, and a west front the former requirement. There are several reasons why this position is preferable. The coldest winds, more particularly in the early part of the season, being from the west, and north-west, there is a better chance of keeping back vegetation in the spring, and of preventing the invigorating power of the sun at that time, thereby helping the vines to rest for a time, and retarding the buds. It is also advisable on account of the young and sappy growth being liable to mildew during the damp and close weather of July and August, at which times this pest is more than usually prolific, and generally when the wind is south, or south-east; so that if the house be turned, as it were, away from these points, the influence is somewhat destroyed. It may be thought, from these considerations, that north-west would be better still,—so it would, but for the deficiency of sun light that in such case would be the result, for under any and all circumstances, the grape-vine delights in a free exposure to the action of powerful light, and without a due proportion, the after growth will not become sufficiently concentrated to store up the required elaborate juices, or produce healthy and active roots.

Improvement, and greater perfection in all buildings, is now advancing with rapid strides, and these lean-to glass houses are beginning to be looked upon as obsolete, and whenever, or wherever such shed-looking structures, with bare back-walls can be, they ought to be avoided. Under some circumstances they are better adapted to the situation of the garden, but it is only where they compose a boundary line of a parallelogram, and when the back part is not seen; in such positions they are admissible,

and, also, where strong heat has to be kept up all the winter, but there are many instances where such might be avoided in outside appearance, and yet the inside remain the same in character, and so with the retarding house.

Any person who wishes to erect a house for this purpose, is sure to have one or more graperies, and most likely one for the general summer crop, which is only partially forwarded; in which case, a double span, with the ends north and south, and divided longitudinally through the centre, would answer both purposes; the west side being used for the late, and the east for the

Fig. 10.



earlier crop. We do not advise the east front as the best in a general way, but when it gives the advantages here mentioned, there is no reason why it may not be adopted, and we speak from experience in saying that good grapes may be grown as a second early, or general crop, with an eastern slope of the roof. The annexed end section, fig. 10 will explain better than words how such double detached

houses may be constructed, so as not to show even the convenience for the heating apparatus, further than a door to shut down over the under-ground vault, and even this, if thought objectionable, may be made to form a part of one of the pathways inside. The example given is an arrangement of, and now under the charge of, the writer, and answers admirably. Hot water is here used for heating, but the same is equally applicable to the furnace and common flue, with the difference of placing the chimney at the opposite end.

Since the above was written we have been apprized of a method of ventilating double pitch curvilinear houses, which has been invented by Mr. William Webster of Rochester, and for which he is about taking out a patent. His plan consists in having a movable chamber along the whole length upper part of the house, and which he can lift or lower at pleasure. If the machinery can be made to work well and kept in permanent order, he has conferred a great benefit upon the public, and deserves the thanks and support which all such useful improvements ought to receive.

CHAPTER III.

ARTIFICIAL HEAT AND APPARATUS.

In the first stages of civilization, man was contented to eat the fruits of the earth as nature produced them in each division of climate, or separate locality, but as luxury crept in, he began to wish for those of more favored climes than the one in which he, in many cases, happened to be placed. His earlier peregrinations into more southern countries enabled him to see the splendor of tropical flowers, and taste the luscious fruits which there abound, and to enable him to enjoy these desirable additions at his own home, it became necessary to imitate as near as could be done, the climate from whence they came; and here is the first inducement to use artificial heat, which though of imperfect character so far, to a certain extent, answered the purpose. This partial success set ingenuity to work, houses constructed partly of glass were erected, and so the thing has progressed from the half-glass, half-slate building, with clumsy stone or brick flue, to the Crystal Palace, and the elegantly modelled and scientific hot-water apparatus, until, even in most inhospitable regions, the fruits and flowers of the torrid zone are produced in equal, and sometimes superior quality, to that which is found in the places to which they are indigenous; besides which, skill has so far triumphed, that by a judicious application, or withholding of the artificial caloric, a succession of crops may be had to suit the desires of the most fastidious mind.

To say the best we can of artificial heat, it is only a necessary evil, but as we cannot do without using it, we ought to put in practice the best and most economical method that is at present known. The only advantages arising from this necessity, is the raising of the temperature of, or drying the atmosphere in any given house under care, so as to suit the particular purpose intended, and so far, by adopting the latest improvements and forecasting as to what is required, we can work along with comparative surety. There is no use of entering into a theoretical disquisition of the relative properties of caloric, nor of showing up the science of chemistry in combustion, our object is to find out how we can at the least expense, and with the more certainty, apply this subtle principle. Suffice it then to say that there are about four ways in which we can adapt it to our use, viz.: by steam, hot water, brick flue, and what may be considered a modification of the latter, the technical term Polmaise.

Steam is of no practical use, unless where a large extent of houses, all in the immediate vicinity are to be heated, neither can it be used with any certainty, unless the water is kept up to the point when the steam is given off in great quantity, so as to force it through the pipes, and the heat along with it; besides there is the great disadvantage of a want of bulk of heated substance, which is sufficient reason why this mode should not be adopted, for on the fire going down, the house immediately becomes cold, and consequently without the most careful attention, there is danger at almost any moment in severe weather, of injury to, or the loss of a crop.

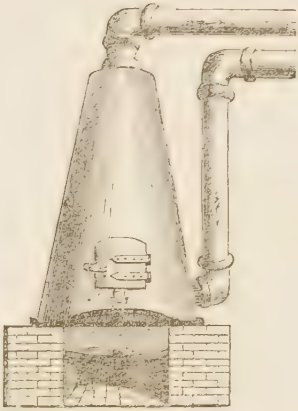
Hot Water has of late years become, and most deservedly so, the popular favorite for warming plant and fruit houses. This method possesses the advantage of raising the temperature without parching the air, or giving out

any noxious gases, and if constructed on the best plan, may be placed on the credit side of expenses, there is also a steady heat in the working, and a sufficiency of bulk in the quantity of water, which, when once put in motion, continues to flow with increased or lessened velocity, according as the fire is kept up, and for some time even after no further heat arises from the furnace. There have been different methods adopted, as reservoirs for circulating hot water, such as lining the inside of brick flues with cement; tanks of wood; tin or sheet iron troughs, with the tops left loose, to be covered or not, as circumstances may dictate; circular copper, tin, zinc, and cast iron pipes. The cemented flue is objectionable, as the material is so non-conducting, that there is great loss, and the cement is also liable to crack, which causes leakage. The open tank, and trough is well enough for a propagating house, which is generally small, and kept very damp, but is not suitable for a grapery, in which is required, a moist or dry atmosphere, according to the different stages of growth; this plan also occupies much space, and looks unsightly. Tin pipes are not advisable from their tendency to corrode, and unendurable qualities. Zinc softens when hot, and is next to useless, copper if made strong enough to resist hard knocks, and be really serviceable is very expensive, so we are driven to the last substitute, cast iron, which answers every purpose, is lasting, erected comparatively cheap, strong, and the different lengths are readily cemented, the joints becoming as firm and tight as any other part. The construction of boilers for this purpose is also various, and there is a great difference in the consumption of fuel, according with the ratio of heat distributed to the water. In the most primitive boilers, the fire only played on the under surface, and the consequence was, a great waste of heat, unless the residue was con-

conveyed around the house in a flue, which almost nullified the improved principle, but of late years a great improvement has been accomplished, so much so, as to make it almost perfect. After having been acquainted with nearly all kinds, I have not found any to give so much satisfaction as the one constructed by A. E. Hitchins, of New York, of which fig. 11, is a longitudinal section, and fig. 12 an

Fig. 11.

Fig. 12.



external view. This boiler is a double casing, between which, and the internal connections, the water is contained. It occupies very little room, and requires no masonwork, excepting a few courses of bricks below, to raise it up sufficiently to give an ash-pit underneath, and a chimney or pipe to convey away the smoke. This apparatus when completed, with pipe four inches in diameter, boiler included, will cost from one dollar to one dollar twenty-five cents per lineal foot on the measure of the pipe, and a house forty feet long for early forcing would need about two hundred feet, so that reckoning the

greater price mentioned, the expense would be two hundred and fifty dollars, but for a longer house, or when a larger order were given, the comparative cost would be less.

Brick Flues.—Heating by brick flues is often practised, and if they be constructed on the best method, with good workmanship, they answer very well; the expense on first erection is less it is true, but they often want repair, besides which they are unsightly and cumbersome, and as a general thing, will consume more fuel than a hot-water boiler on the above plan. If the situation, or circumstances, make it more convenient to burn wood instead of coal or coke, then the flue is to be preferred; in such case the furnace should be large, and the draft be under the control of the operator, by having a door in front of the ash-pit, and a damper in the chimney, which, when closed, more or less, as may be wished, will keep the fire steady.

There are some cultivators who still cling to the flue for grape-growing, on account of the drying effects of the heat evolved, which, as they assert, is of some importance in damp weather, when the grapes are coloring, or ripe, and that at other times they can use evaporating pans. True, it is dry enough, even to parching; and were this the only time when it would be required, the flue would answer the best purpose. But this point is a matter of very little consideration, as the same can be secured by pipes heated with hot water. Nothing can be more erroneous than to suppose that heat given out on the latter principle contains moisture; were it so, the water would waste considerably through the pores of the metal, which is not the case, for all or nearly the whole of the evaporation which takes place is at the filling up tank, and if this be kept covered, the working of a night will not lessen the water more than a few pints. Heat, from whatever sources obtained, will absorb moisture, and as glass houses are not

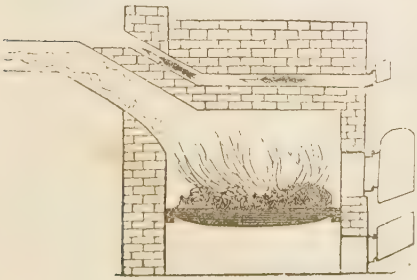
hermetically sealed glass bottles, the generated heat is constantly passing off through the crevices, more particularly those in the upper part of the roof, and the moisture along with it, The main difference, then, between the two is, that one only raises the temperature, while the other does the same; and, in addition, imparts a certain amount of sulphuretted hydrogen and other injurious gases that escape through the joints and the bricks, in quantity according to the good or bad workmanship, or the porosity of the material. "Smoke has thin shoulders," is an old adage among gardeners, and we often find it verified in the use of flues. Notwithstanding these disadvantages, good grapes may be forced by flue heat, and in some cases this is the only means at command; when so, it is advisable to make the best arrangement we can. If a steady and continuous heat be required, there ought to be enough room in the furnace to hold a large bulk of fuel, and if it is situated somewhat below the level of the flue, the heat will flow more evenly, and disseminate itself more equally, as it travels along with the draft, by which a greater portion will be absorbed by the bricks, and given off into the house. A small furnace, with a quick draft, is never economical, as a considerable portion of heat passes off by the chimney and is lost. A narrow and small flue is also objectionable, as the heat acts directly upon the mason-work, and the bricks become so hot as to abstract the oxygen of the air, rendering it so devoid of moisture as not to be fit for the leaves to respire in. To a certain extent, this evil may be counteracted, by keeping shallow vessels filled with water upon the flue, and damping the floor of the house; but most of the moisture produced in this way is in a vaporous state, and not in the exact solution required by the absorbing stomata of plants. The analogy be-

tween plants and animals is in this respect the same, and every body who is possessed of ordinary observation must be able to discern how different is the air that is raised in temperature by a red-hot stove, even though a vessel of water be kept upon it, to what it is when raised to the same temperature by the sun's power. We also know, that if we were able to control other circumstances according to our wants for the time being, success would more often attend our operations, providing we could exactly imitate the warmth of nature. If this be true, it must then be certainly to our own interest to approach as near as we can to this desideratum. To come to our point, a capacious flue gives a greater surface exposed to the action of the heat, without becoming hot enough to bring about so much chemical action as to burn the air inside of the house, while a small one is sure to do so, at any rate, in that part next to the furnace. To be effectual in this respect, a flue ought not to be less than eighteen inches high, by twelve inches wide in the clear; and if raised up by placing supports underneath at intervals on the length, with fire-proof tiles to form the bottom, so much the better, as it then is free to give out the heat on all sides. The furnace ought to be not less than eighteen inches wide, and equal height, independent of the arch above, and two feet long. A furnace of these dimensions is qualified to work a house of forty to fifty feet long, by twelve or fourteen feet wide, the flue being conducted along the front and two ends. Double the length will need two fires, and so on in proportion. When two furnaces are required, there may be one placed at each end of the house, and conveyed to the same chimney, midway in the back wall, so as to unite into one outlet; but in such case there ought to be an acute level upwards at the place of union, or the two

opposite currents are subject to check the even flow of the smoke, and drive it back.

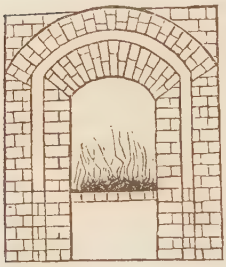
The *Polmaise* method of heating is a plan that originated with a Mr. Murray, of Polmaise, in Scotland, and, like many other ingenious contrivances, was the result of peculiar necessity. At the time of its introduction, it caused a great furor amongst the seekers after novelties, and like the fugacious follies of such persons, it soon fell into disrepute with all, excepting those who were determined not to acknowledge their error. To say the best we can in its favor, it is only a modified flue. The principle, if so it may be called, consists in having a hot air chamber over and outside the furnace, and conducting the heat therein generated through one or more apertures into the house at one end, and at the other having a hole level with the floor, which forms the top of a drain that is conducted along under ground to the furnace, and which supplies the fire with fresh air to support combustion. By these means the heat from the chamber is drawn through the house, and a partial current produced, and from this it was at first predicted that a great benefit would arise, on account of the near imitation to nature's invigorating breezes. If glass was not a rapid conductor of heat, this plausible theory might have been a practical good; but as it is, and as heat will ascend, in opposition to such a weak power to repress it, a great portion flows along at the top and back part of the house, leav-

Fig. 13.



ing the lower part, or front, cold; which, if there be a difference, ought to be the warmest. The only way in which this plan can be tolerated, or be of advantage, is, to combine the chamber and flue, and make use of both. This is economizing, as the whole of the heat which radiates from both sources is made available. Figs. 13 and 14 show a longitudinal and transverse cross section of both combined.

Fig. 14.



In concluding, we may say, that after many years' practice with most kinds of heating apparatus for hot-houses, we are thoroughly convinced that none is so efficient or economical as hot water, and have never found any on that principle to supercede the boiler, as exhibited in Fig. 12.

CHAPTER IV.

BORDERS OR PREPARED BEDS.

THE formation of beds, or more technically borders, in which to grow the grape vine is of great importance, perhaps more so than any other portion of the whole routine of culture, for without a proper matrix in which the roots may luxuriate, it is impossible to succeed.

The more important any branch of horticulture is, often the greater the number of opinions respecting it. This is strictly true, in the present instance. Some have advocated the admixture of great quantities of raw animal carcasses, in such quantities, and large masses, that one would think, if their reasoning were true, that a recently filled cholera burial-ground, would be the best place on which to erect a grapery, or plant a vineyard. Others again have recommended large doses of blood, and the stinking offal of slaughter-houses, in so fresh a state that the very idea is enough to nauseate the strongest stomach, and forbid the cultivation of this luscious fruit. Fortunately these materials are not required, although when thoroughly decomposed and well mixed with maiden earth, there is no objection to the using of a portion incorporated through the mass. It often happens when thus applied, that a very vigorous growth is produced for a time, but sufficient strength can be had without these stinking nuisances. If used at all, it should be in the form of top-dressings in after years, and forked in, by which the fertility will be assisted, without making the whole bed into

an unctuous paste, more fit to puddle a duck pond with, than for the tender and fleshy roots of the grape vine to luxuriate in. If proof of this were wanted, there are plenty of examples if they were to be examined, where the roots that have come into contact with these masses of soap-like substances, before they were thoroughly decomposed, have been found quite rotten, and if the vines have continued to do well, it is not from the nutriment derived from them, but from their ready adaptability to form fresh spongeoles from the back roots, which may have travelled in other directions, and with good treatment added.

The advocates of this putrid animal matter, contend for the greater invigorating powers and more lasting properties, than is to be found in barnyard manure, or decayed vegetable substances. To the first we will agree, providing the stimulating portions be administered in a proper manner, and here ends this part of the difference; but how it is to be more lasting, is another part of the subject. It is a well-known fact, that highly nitrogenized manures, during decomposition, give off very freely the volatile ammonia contained in them, and as this is a great stimulant to vegetation during active development, it is easily seen how such wonderful effect is produced; as this exciting principle, from its evanescent properties, porcolates into every aperture in its escape, and no doubt a portion is taken up in a gaseous state by the young and readily absorbing spongeoles. But does it follow, that this is any proof of permanent action. Judging from the premises it would appear the very reverse, and the frequent use of other manures of a similar character—guano, for instance—have clearly demonstrated, that oft-repeated applications with occasional additions of carbonaceous organic bulk, and other inorganic assistance, have to be applied to maintain fer-

tility, where the same spot is constantly cropped. In the present subject we are precisely in this position, and there ought to be great regard for the future constitutional power, if a healthy after-life be cared for, which is not to be acquired by the excessive quantity of these helps, that only act upon the vegetable, in the same manner as do alcoholic drinks upon the human system. All our best physicians acknowledge the good effects of stimulants in particular kinds of disease, when administered with skill, and everybody knows how soon the strongest constitution is broken down by the great quantities that too many indulge in. So it is with the grape vine; we all commence with endeavoring to gain strong, and more than natural growth, but there certainly is no reason why we should keep our plants in a continual state of intoxication, from the moment of their first awaking in the spring, till they finally rest on the approach of winter, and *still* leaving the same baneful influence, to diffuse itself over the whole outer surface of the roots (which are equivalent to the mouths of animals), until the next season's warmth again arouses their action. We would not by any means have it understood, that we are opposed to the judicious use of ammonia, or any of the other compounds that are to be found in more abundance in the animal, than in the vegetable body; but do protest against the inordinate mixture of such, often to the exclusion of other, and more necessary bases, and which leaves the plant after a few years of undue excitement, a prey to disease and premature decay. If success has seemed to attend the progress in some instances, the failures have been much greater, and unprejudiced experience shows, that more injury than benefit has arisen from the admixture of animal matter, even in small quantities, and in anything like a fresh state.

These remarks are only intended to apply to the fleshy

and quickly putrefying portions of the animal body, without any reference to the bones. Here we will subscribe to the recommendation, because it is consistent with nature, and furnishes along with other useful properties, the often most wanting requirement, lime; in this all grape growers are agreed, and the invariable prosperity of our pet, in places where limestone abounds among the soil. produces the most conclusive evidence. There is little doubt but the want of this substance is the reason why some of our *vignerons* have occasion to complain of rot and want of success in various ways; and here we may ask, whoever saw a grape vine that did not do well, and produce fruit of good quality, providing the climate was suitable, and the roots could creep along under the soil, and lie upon the surface or in the fissures of a limestone rock.

There are other persons who make the beds from three to four feet deep of suitable materials, but use such quantities of the richer quality, with insufficient drainage, that the whole bulk, after a time, becomes sodden, and impervious to either sun or air, in which no root can exist, much less extend itself. These are some of the many causes why our graperies so soon become weak and unproductive; yet the natural constitutional powers of the grape vine are very strong, and of great longevity; it is a gross feeder and can absorb a large amount of food, but when thus maltreated, although it may bear such usage for a time with much pertinacity, it will in the long run (like an overgorged glutton) become deranged, its physical functions will be weakened, and it either dies of plethora, or wears on an exhausted existence, producing little or nothing but watery leaves, and weakly branches.

If such very strong growth were really requisite to produce the finest bunches, or berries, and could be obtained

by these means, there would be some excuse for thus abusing nature; but such is not the fact, for the most superior and best flavored fruit, is had from solid, well ripened, and vigorous, but not over-fed wood. When the bearing shoots are unduly strong, there are frequently two or more developed from a bud, while with moderate growth only one is formed, and as each of these buds having received its share of nutriment, wherewith to start future development, thus takes from the others a portion, the consequence must be (as only one can remain) a weaker action at first, and correspondingly less power afterwards, than would be the case if there was only one centre. The bunches emenating from such a bud, will also contain generally a greater number of florets, and shoulders, equal to the concentrated accumulation in the embryo shoot; for it is formed previous to bursting, and before the leaf of the previous season falls, in the axil of which it is fixed.

In all cases of permanent success, the grape vine luxuriates upon a naturally, or artificially well-drained bottom. It is best suited in warm, and comparatively dry climates, and the constitution which nature has fixed, man cannot alter. We must then adapt as near as we can, its position in cultivation to its wants, and if we produce artificially a greater than ordinary amount of growth, we ought to have a corresponding medium whereby to mature that growth. Well-drained borders is one of the means by which this can be accomplished, as the superabundant moisture is taken away, and the air and the sun's heat can more readily penetrate the soil. If the following directions are followed, there will be no reason to complain of want of success on this point.

Take out to the depth of two feet, the whole of the upper surface, then dig a trench two feet wide and one foot deep, with one or more outlets for the water to escape, all

around the margin of the excavated space, which will form a drain, three feet deep from the top, and one foot below the lower base of the borders; fill this trench with rough stones, or brick-bats, the rougher the better; afterwards fill in over the whole surface, about six inches of oyster, or other marine shells if to be had readily, but if not, broken stones, or pieces of brick and lime rubbish will answer, and if a quantity of broken bones are to be got, strew them over the top of the other drainage; cover this with turf-sods, or any rough litter, to prevent the soil from falling through and among the drainage, and throw in the prepared compost to one foot above the top level; this will give a depth of three feet, which will settle down about six inches, leaving the permanent depth two feet six inches, viz.: two feet below and six inches above the ground level.

In some situations the original base will be a dead level, when the excavated surface ought to slope from the house towards the outside of the borders, which will cause the water to run the more readily towards the lower drains. Care should be taken in this respect, whatever the level may be, that the bottom is so arranged as to allow the water to escape freely; the means of securing which will occur to any ordinary mind, according to the level he may have to deal with.

It may be thought, that with this amount of drainage, and raised, and not over deep borders, the soil will become too dry throughout the summer to maintain vigorous growth, but experience testifies to the contrary, for although the under parts will not be over wet, the moisture is equally divided through the whole, and if the upper surface be mulched, examination will prove that every portion is equally damp, and the innumerable small rootlets are ramifying in every direction, each taking its

allotted portion of work, to supply the structure of the plant with wholesome food. Effectual drainage has not until lately received that share of attention among cultivators generally which its benefits ought to command, and even at the present day, there is a great want of proper understanding respecting it. To a person who is contented to go along scratching over the ground, sowing seed, and leaving the rest to Nature, it is a difficult problem to solve, how the conducting away water in land that is already too dry and hard in summer can be of any service. Thanks to science and agricultural chemistry, this is now made so clear, by having been so often explained, with examples here and there as proofs, that the mystery is, how men can still remain so blind to their own interests, or entertain any prejudice against what has been so practically demonstrated.

Although it is recommended above to make the whole of the borders at once, which is only one trouble and expense, and will answer very well; yet it is much better to prepare the drainage as advised, and make only half, viz.: that part next to the house, of properly prepared compost, filling in the other with the intended base soil a little enriched, and after the first season's growth, work up in the following fall, into the half of the unfinished portion, the same quantity of fertilizing materials as the former half was mixed with. In the spring, before growing commences, this may be again forked over, which will incorporate all more evenly, and the next fall the remaining quarter may be done likewise. By this method the borders are kept loose for a longer time, the air is more freely admitted, and the whole is better adapted for the healthy progress of the roots, which, as they extend from year to year will penetrate more readily, and fill every portion. The tendency to become solid, is much reduced

after the borders become filled with roots, as they are always more or less drawing nutriment and moisture, thereby rendering the base soil more porous, when the gases of the atmosphere, which are very beneficial, have a chance of occupying the interstices, and forming chemical combinations with the material; thereby producing a continual renewal of suitable food for the support of vegetable life. We have ample proofs of the correctness of this, and where borders are constructed as above advised, there will be an admission of air, not only from the openings to the drains and from them under the whole bed, but also from above.

It is not by administering such enormous doses of stimulating, or fertilizing material all at once, and before the roots have progressed in sufficient numbers, or distance, to appropriate it to their use, that we are to calculate upon the most permanent results, or immediate success. So long as we supply from time to time what is required, it is enough, and if we have got well drained and porous borders, we can the more readily apply top-dressings and mulchings in after years, without injury, or covering the roots too deep; for if, in efficiently drained ground, a layer of dung be spread over the surface, it will be found after a time, that there is little but dry chaff left, all the soluble parts having been washed by the rains down into the soil below, and the plants will have received the benefit of it.

With regard to the width of these borders there are many opinions, and different persons have been led by the dictation of fancy into dogmatic assertion, without duly considering the requirements of nature. Now, if we take this for our guide, and, generally speaking, it is the best reasoner, we must provide a large superficial area; for the roots of the grape vine are great travellers, and will, if allowed their own way, extend over much space,

consequently free egress and plenty of room must certainly be essential, where the intention is to retain uninterrupted fertility for a long time; beside which we ought to consider the close proximity of the vines as they are most commonly planted, and it then becomes still more evident that we ought not to be penurious in this respect. Our own recommendation is to make them ten feet wide at the commencement, add five feet more the next season, and five feet again the year following, making a total of twenty feet, which will give ample space for a long time; but if success should attend the same stock some ten or fifteen years, and the roots at the end of that time are found so closely interwoven, as to be in want of more extension, it would be advisable to add another five feet, so that in making first designs, it is well to forecast after necessaries. Many will, no doubt, think that this is a waste of land that might be turned to advantage in other ways, and others may not have so much ground at command for the purpose. As to the first objection, it may be answered by the simple question of, what more paying crop can be put on the added fifteen square feet that will be required for each vine, than the increase of two or three pounds of good exotic grapes, beside the benefit secured by retaining the natural longevity of the plant, where considerable capital has been invested at the outset in erecting a suitable house. In the latter case there is the opportunity of reducing the number of vines inside, and extending the branches of those left so as to keep the whole roof covered, thereby giving more root room individually. The very common notion, that a grape vine is so often worn out, deserves to be classed with the things that were,—depend upon it, if all its wants are duly supplied, and the house substantially erected, a grapery may be left as a legacy

to our offspring, instead of being, as it too frequently is, only calculated to become the pleasure of a few years.

The most suitable materials for composing the borders are, a good friable loam (the top sod, grass included, of a pasture), with a suitable quantity of partly decomposed stable manure, in proportions of one-fourth of the latter to three-fourths of the former, and a good dressing of broken or ground up bones, say one bushel to every cubic yard in bulk. If the soil contains much lime in its own base, the bones may be dispensed with, but generally they are of much benefit, being a very lasting manure, giving out slowly, and when all the phosphates are exhausted, they still remain as a carbonate of lime, among which the grape vine delights.

When the base soil, where the house is to be erected, is of the above nature, it may be used, and the other materials added on the spot, which will save expense. There is often much useless expenditure caused in this way. Never remove away the existing base unless absolutely bad, excepting with little outlay, a much better substitute can be procured; for by good mixing of the fertilizing matter and drainage to correspond, a poor soil may in many instances be made good, and often when it is considered impracticable, most likely all that is required. Imperfect drainage is frequently the cause that prevents success, when it is attributed to an unsuitable constituent base. The grape vine is not so capricious in its food as is generally supposed, but a dry bottom it must and will have to prosper.

CHAPTER V.

PLANTING AND MANAGEMENT THE FIRST YEAR.

In choosing vines for planting, see that the wood is well ripened and solid, and the roots clean and healthy. One year old, propagated from the eye are best for the grapery, or from cuttings for the vineyard, but those of two years are not objectionable. The most proper time for planting is about the beginning of March, under glass, or so soon as the ground is in good working order, out of doors, when the vines have not been prematurely started into growth, as they are then just commencing to move from a long repose, and have no great time to remain in their new quarters before fresh rootlets begin to push forth. When deferred much longer, these fibres are subject to injury, being very brittle. If the vines have been grown in pots, which is generally the case, with the exotics, the soil ought to be entirely shaken from them, and the entangled roots carefully straightened out, care being used when planted, that they are spread in all directions diverging from the stem. After loosening up well, and smoothing over the surface around on the base, where it is intended to fix them, have in readiness a quantity of the same material as the border is composed of, broken up fine and mixed with a third portion of leaf-mould, if to be had—if not, it is not of much consequence, but the young rootlets soon lay hold of it, and a good start is half the battle. Strew two inches of this compost over the sur-

face, place the plant thus spread out upon it, and cover with three inches of the same mould. It will be understood that this mode of procedure will elevate the crowns of the roots a trifle above the general level, which will prove advantageous afterwards, as a top-dressing can be added without their being buried down below the surface. Avoid deep planting in all cases, for it leads to cankered roots, and places them out of the reach of the warming influence of the sun, and the exhilirating action of the air, both of which are as beneficial to them as are light and heat to the leaves and branches. It is not to be expected that this particularity can be applied to the vineyard, but so far as can be done economically, the same rule holds good. Before planting, cut off the top of the plant to about six or nine inches, or down to two or three good buds. The advantage of leaving more than one being the choice it gives of retaining the most promising when started, when all the worst can be rubbed off.

It is sometimes inconvenient to plant at the time above recommended from some local cause, in which case, the plants may be removed into pots, if so situated, of a larger size than those that they were previously in, put to grow in some other house, and attended to as regards heat and moisture, in the same manner as if in their final resting place; as the young shoots progress in growth, they will require to be carefully tied to a stake fixed upright in each pot, and as the roots increase, larger sized pots will be requisite to prevent them becoming pot-bound, by which the vigor is consideraby checked. By attending to these points, they may be kept on till June or July, after which, if carefully turned out of the pots, without disturbing the roots any more than can be avoided, a good cane may be obtained the same season, though not often strong enough to bear fruit the following summer; but

which, if planted in March, can generally be accomplished. After planting, give a good soaking of water to settle the soil around the roots, but do not allow it to become saturated afterwards by too oft repeated applications, the object being to keep it moderately moist, but not sodden, as the tender roots are soon rotted when not drawing freely.

If the vines have been prematurely started into growth, which is not desirable; or it is thought fit to plant those that have been raised from the eye the same spring, the planting ought to be deferred till the middle of April, or beginning of May, even though the house may be ready in due time; for if planted sooner, they would, under such circumstances, receive a sudden check, from their being removed into a much colder atmosphere than the one they had previously occupied, and which would militate very much against their future prosperity, if not be the cause of failure.

We will now suppose that the house is planted and all ready for a favorable beginning. For the first two or three weeks keep all as close and cool as possible, only giving sufficient air to lower the temperature. After this time the house may be kept a little warmer, and the vines syringed overhead two or three times a-day. Do not yet apply much water to the roots, only maintaining moisture enough to keep the soil damp, without becoming soaked. as they have not yet got into brisk action, and consequently cannot draw much of it up. Avoid dry winds, and retain a moist atmosphere, allowing the thermometer to rise from 70° to 75° in the middle of the day. By the middle of April the buds will be mostly started, rub off all but the strongest one, and mind that it is not injured, or the top broken out. As the young growth continues to extend, the paths, and the whole interior of the house, and likewise the plants, should be damped with the syringe or

hose morning and evening, and during dry weather in the middle of the day, avoiding the application in the brightest sunshine. Do not give any bottom air until a vigorous and strong action is obtained, and not then without great caution, for it causes cold drafts in the lower parts of the house and checks growth, rendering the vines subject to mildew. Shut up early to retain a genial warmth before sunset, and gradually increase the temperature, so that at the beginning of May the thermometer may stand at 90° at mid-day; in cloudy weather keep all closed and endeavor to keep as steady a heat as possible. By the latter end of the month, the vines ought to be growing vigorously: tie the canes up carefully as they progress, leaving the ties somewhat loose to give room for after swelling, and as the laterals push, pinch them off to one joint, reserving one or two entire at the top at each pinching in case of accident to the leader, and likewise take clean out the lower ones, or those last left with one leaf, at each future operation. By this mode of proceedure they are gradually reduced, and finally taken away, without endangering the bursting of the buds in the axil of the leaf-stalks, the which are wanted for the next year. The heat may now be increased to 95°, still recollecting to ply the syringe freely, excepting in dull or cold nights, when water ought to be withheld, as under such circumstances it is apt to starve and check the circulation—a matter of great importance.

The roots will now be extending in proportion to the expansion of head, and must have some attention; for here are the mouths, and here are also the digestive organs, and woe betide the other members of the body if they are not well supplied. Equally with the amount of healthy foliage will they draw moisture from the base in which they are located, so long as free development is

progressing, and water ought to be applied to the soil accordingly. As there may be reason in all things, so in this, and the borders ought not to be saturated by too often repeating the application, but of this there is not much danger if the under base is well drained. A forking, both inside and out, over the whole surface, will now be of service, but do not injure or disturb the roots; this will loosen up and render the bed more porous, and the small rootlets will feel their way more freely, after which a mulching of dung or short grass, four or five inches thick, will prevent evaporation, keep an equal temperature and moisture in the soil, and, during hot and dry weather, will almost entirely prevent the want of that greatest of evil necessities, artificial watering, to the outside beds. Gradually increase the heat as the vines progress more rapidly; by the beginning of June it may be allowed to rise from 95° to 100° at mid-day, and if the air is kept damp, scorching from so high a temperature will be prevented, and both combined will enable the plants to develop their fullest energies.

Many persons do not give heat enough; even some of our very best grape growers are sparing in this respect. We ought to consider that, as the grape vine is generally grown under glass, we place it in a position, by the supply of rich food, to produce a more than natural distention of cellular tissue; the larger leaves also are capable of doing more work, in elaborating the juices drawn up from the roots, and these large leaves being filled with an uncommon amount of sap, require a corresponding assistance in the form of heat and light, to properly chemicalize (excuse the expression) this extra quantity of crude fluid. Hence the necessity of a warmer temperature than would suffice for the same plants, if they were growing in the open air, and the roots in a soil only ordinarily fertile.

When the canes have grown to the top of the roof do not stop them, but train the tops between the vines on the opposite side, if the house be a double pitch; and if a lean-to, they may be allowed to hang down by the back wall, stopping the leader when it has advanced somewhat downwards, and leave the laterals on the same length. Thus the plants will go on swelling their growth without check, and adding bulk to their structure.

Towards the middle of August, the air may be allowed to become somewhat drier, and syringing overhead gradually lessened, as the wood will begin to mature: the lower ventilators may also be opened on clear days—a little at first, increasing more from day to day. By the third week in September, water should be withheld altogether, and as the wood will be ripening, air ought to be freely admitted through the day, and the temperature decreased as the canes approach maturity. When the bark becomes brown and the wood solid, the house may be thrown open day and night, excepting in case of frost or heavy rain, as the object now is to let all go quietly to rest, and the leaves to fall off yellow and fully ripe, when we may rest assured that nature has done her work according to her own will, and we have assisted her in accordance to her own laws.

So soon as the leaves are fallen, proceed to pruning. If all has gone on as it ought to have done, the canes will average five-eighths to nearly one inch in diameter, according to the natural vigor of each individual variety, and a corresponding length when not stopped, of twenty-five to thirty-five feet. Cut off the strongest to about seven, and the weakest to five feet. Afterwards take out with the point of a knife each alternate bud, which will leave the remainder about fifteen to eighteen inches apart, the object of which is explained in the chapter on pruning, Commence at the

top, leave three buds, one for next year's leader, and the two others for side spurs; proceed downwards, leaving each alternate pair (one on each side) to the wall plate, and as beneath this, the leaves and fruit would be out of the sun's influence, and only subject to encourage mildew, all buds ought to be removed.

The vines may now be carefully washed over with the following preparation, which will destroy the larvæ or eggs of insects, if any should be existing. Whale oil soap, one-fourth pound; sulphur, four pounds; tobacco, one-fourth pound; and nux vomica, one ounce: pour over these boiling water, three gallons, and stir all up until thoroughly mixed; as the nux vomica is a deadly poison to animals, care should be taken that it is not left carelessly about. A soft painter's brush is the best for the purpose, and after the operation the canes may be slung loosely to the wires till the weather begins to be severe, when they should have a coating of straw three or four inches thick tied around them, and the heads brought down one over the other in a horizontal position, about two feet above the ground level, in rows along the lines of planting; this will leave the lower parts of the stem nearly upright, and prevent the crown of the roots from being strained or disturbed. At the same time, be prepared with a quantity of recently rotted turf sods, or fresh earth, which has been mixed up two or three months with a third part of good stable or barnyard manure; fork over the borders both outside and inside of the house, and add a dressing of three inches thick of the above compost. If the crowns were planted slightly elevated, as before recommended, this dressing will make the surface level, and greatly assist the production of young rootlets next spring, besides protecting the tender fibres through the winter. Over the whole area may be put a good coating

of littery dung, tree leaves, or other such material to keep out the frost, and which may remain as a mulching next summer.

Nothing further is now required, but to shut up the house on severe nights and wet weather, till the buds show signs of bursting in the following spring.

CHAPTER VI.

MANAGEMENT FOR THE SECOND YEAR AND PERMANENT TREATMENT FOR THE COLD GRAPERY.

THE following observations contain directions for the treatment of a planting of vines in the second year, the permanent management of the Cold Grapery, and some other details of a general character.

As the winter milds off, and warm sunny days commence, give air sufficient to keep the house cool, and to prevent the buds from pushing as long as possible. If too soon excited, the young shoots are in danger of being injured by the late spring frosts, and cold storms. When it is perceived that the buds are swelling, and can no longer be kept back, take the covering off carefully, and tie the vines down in the form of an arch, with the heads leaning from the glass, as in this position they are not so subject to injury in case frost should occur; there is also the advantage of causing a more lateral propelling force to the rising sap, which is compelled to develop the lower buds with more certainty, and this action once gained, with after good management always remains. Give a good and thorough soaking of water to the inside borders, which by this time will have become very dry, also syringe overhead two or three times a day, excepting when the weather is cold, or frost is to be expected, they will be assisted thereby to break uniformly and strong.

The temperature should now be regulated as advised for the same period last year, in the preceding chapter.

When the young shoots begin to elongate, sling the canes loosely to the wires, but some distance from the glass, as the further off for a short time the safer they will be from accidental frosty nights. So soon as danger is past, tie them finally in their places, leaving the strings loose enough for future swelling, and be careful in training the leading shoot upwards, as at this time it is very brittle and easily broken. If not quite straight with the older cane, the better way is to bring it into the right position, a little at a time, when the woody fibre begins to form in the base.

The bunches will now be clearly discernible, and when they have fairly unfolded from the buds, so as to show their form, and comparative strength, take out all excepting the strongest and handsomest one upon each shoot, and remove likewise the tops of the side branches, beyond the third or fourth leaf above the bunch. These will again break from the top eye, and as they do so, from time to time, nip out the leader to one leaf above where it was last stopped; this keeps the branches within bounds, and at the same time leaves sufficient foliage to mature the fruit and perfect growth.

When the blossoms begin to expand withhold water overhead, let the atmosphere become somewhat drier, and keep up a little more heat, and if the weather will allow it, a freer circulation of air, from 85° to 90° at mid-day is not too much, close with good warmth in the afternoon and open soon enough in the morning, to prevent a scalding smell in the house. At all times, with a clear sun in the morning, ventilate so soon as the house begins to warm a little, and close early; the temperature by these means rises and falls gradually. Nothing is worse in all plant

culture, than allowing a house to be closed until it becomes hot, and admitting at once a great quantity of cold air; in grape growing, it leads to the most baneful results. Open soon, and close early, ought to be a maxim well riveted on the mind. Always have a thermometer hanging midway in the house, about four feet from the ground, and shaded from the sun; observe it closely, and be guided by it, and experience in ventilating will soon be acquired, better than can be described by words—always remembering that a gradual rise and fall are the desiderata. Attention for a little while will teach, that early closing tends to regulate the heat in the after part of the day, and a due observance will lead to exact adaptability.

As the flowers continue to open, go over the house once a day, and shake the bunches by a light flirt of the finger, which assists in distributing the pollen, and enables impregnation to go on with more certainty. This operation is best if performed in the morning, about the time or immediately after giving air, as the flowers of all plants are then in greater activity, and consequently there is the chance of more perfect fertilization. There are certain kinds, as the Alexandrian Muscat and its allies,—purple damask, &c., which do not readily fertilize with their own pollen in a cold house; that may be much assisted by shaking over the flowers a bunch of Hamburgh or other hardy sort, and as there are more bunches than is required for ripening, there is always enough to spare for this purpose.

When blossoming is past, and the berries are fairly set, a good syringing over-head will clean all the decayed portions of flowers which cling to and among the berries, and will invigorate the whole plant. Let water now be freely administered over every part, being careful that at no time it is driven with force against the fruit, as in such case it injures the surface, and produces "rust."

It will now be plainly seen which are the best set and handsomest bunches, and as there are more than it is advisable to ripen off, on account of the youth of the vines, and the consequent danger of overbearing, thereby injuring their permanent prosperity, it will be better to reduce the number according to the strength of the plant, or weight of the bunch. A cane of three-fourths inch diameter may be allowed to carry from six to seven, and one of half an inch, five to six pounds; but when they are smaller than this, only one, or at most two bunches ought to remain. Some kinds form much larger bunches than others, which may be ascertained in some measure while young, and the number may be calculated accordingly. A well shouldered Hamburgh will weigh from one and a half to two and a half pounds; if very large, from three and a half to four pounds; while the Malvesia is a large bunch of its kind at ten ounces. Better to be guided by comparative weight than number of bunches, as greater equality is gained, and the vines are rendered more uniform in vigor afterwards. Be it remembered, that it is much more difficult to bring back energy where a part is injured, than when the whole is so, for the well-doing will take the lion's share of nutriment from the borders. In removing the superfluous clusters take out the worst formed and most weakly, and let the greater part be near the top of the plant, leaving the bottom spurs as free as possible; for a vine while young is prone to push its strongest growth upwards. By bearing the upper part the heaviest, the circulation is equipoised, and the lower laterals are relieved, and if the flow is encouraged to take a lateral course at first, it is much easier to retain the same afterwards. There is no occasion to crowd all the crop at the top, only let the greater part be there and the object is accomplished.

All is now to be considered in full action,—the grapes about the size of peas, and swelling fast, when it becomes necessary to commence thinning out the superfluous berries. First, tie out the side branches, in a horizontal position to the wires, if not already done; then fasten a string to the end of each shoulder, and sling it up, at right angle with the stalk, to the wires also; the smaller clusters may now be opened out by inserting small strips of wood, notched on the two ends, under them, and supported upon the projecting stalks below. This will open out the bunch, and prevent the weight of each cluster from bearing upon the lower berries. Next, proceed to cut out a part of the berries, commencing at the bottom, and leaving those for ripening far enough apart to allow the aggregate to swell up, without squeezing each other individually when fully grown. Some care is required in this operation, and also a little idea, for the object is to leave to each berry sufficient space to allow for full development, and yet not so far apart as to make the bunch loose and straggling. No exact rule can be given as to distance required, but generally, one half to two thirds ought to be cut away; the larger berried kinds will need more thinning than the smaller, there is also a great difference in the setting, but a reference to the descriptive list hereafter given will be a guide; the latest sorts too, and those intended to hang longest, should be more distant than the others; for, when a little assunder from each other, the grapes keep much longer than when they are crowded. An experienced hand can tell pretty accurately how to thin, so as to make once going over nearly suffice, but for beginners, it is perhaps better to perform the operation at two or three times as they swell up. After the first year's practice the right idea is gained, and there is no difficulty afterwards. When thinning, do not handle the berries,

or let the hair rub them, for while young, the skins are very soon injured, when they become disfigured, and marked with a russety roughness which is technically called rust.

Continue to keep up a temperature of 90° to 100° through the day, and use water freely; damp the lower part of the house two or three times between morning and evening, and, when syringing at sundown, force the water into all crevices and corners of the wood-work, to dislodge insects. Where this is attended to, red spider, or other such pest, will never do any harm. Do not wait until these vermin make their appearance, but always act on the principle, "prevention is better than cure."

As the leading shoot continues to progress, train it over the top to the opposite side, as advised for last year, and when it interferes with the fruit spurs in its downward course, pinch out the top, as it would cause too much crowding, and deprive the leaves from receiving due light.

In very dry weather it will be necessary to use water on the outside borders; generally, one or two applications is enough for the season; but if severe drought should continue, it will be advisable to repeat the operation every two weeks, till the fruit begins to color; after which there is no occasion for more, as there will be plenty of moisture in the ground for all purposes. Were it not so generally considered that large berries are a part of perfection, we should be disposed to recommend the withholding of water at an earlier period; and those who would prefer a rich, sugary grape, regardless of size, will be more sure to get it by using water very sparingly after the stoning process is fairly secured. Under these circumstances there is also a better chance of producing good color, as the drier the atmosphere and borders of a Cold Grapery, the less danger

of mildew; consequently, a greater supply of fresh air may be admitted with safety, the result of which is, more solidity of fruit, a greater concentration of saccharine matter, and, as a matter of course, a nearer approach to the natural shades of color. When water is applied outside, let it be a thorough soaking—no mere dribbling, but sufficient to penetrate down and through the borders. The mulching which was applied previous to winter should also be examined, and if the surface is not well covered, add more. If the liquid drainings of a dunghill can be had, so much the better; but, first, dilute with an equal portion of soft or rain water, and never use it but in a clear state, as otherwise it clogs up the porosity of the soil, and renders it sodden and "sour." The drainage from a cow-house is also very good, but ought not to be applied until somewhat fermented, as, while caustic, the salts contained in it are very destructive to the roots. Many persons apply liquid manures, of various kinds, without caution, and often do much injury thereby, while, if rightly used, they are of the greatest advantage. By the second week in July, some of the earliest sorts will begin to change for ripening, when water may be dispensed with overhead, but still applied to the roots in clear weather, which will cause the atmosphere to be drier. With the ripening of the fruit comes also an approach towards maturity of the wood, and during this period, water is only essential to keep up a healthy action, and should be gradually discontinued. As a little quantity, often distributed, only damps the surface, and the evaporation resulting therefrom produces a moist atmosphere when a dry one is wanted, the times of applying it ought to be less often; but when done, a good soaking should be given. Once a week, for two or three weeks, will be enough, and after that time once in two weeks, up to the middle of September, when it may be withheld entirely.

As the grapes continue to color, admit more air in clear days, open the lower ventilators, a little at first, gradually increasing, till a free current is obtained, which will assist very much in improving the quality in all respects, and likewise help in ripening the wood.

After all are ripe, the house may be thrown open day and night, excepting in storms or wet weather, when it ought to be partially closed, so as to exclude the rain, and at the same time leave air to prevent the grapes from becoming mouldy or cracked.

When frosty nights begin to occur, the house ought to be closed in the evening, and opened again early in the morning. Let the temperature gradually cool down, but keep the leaves from injury, for the grand object now is to preserve them until they fall off perfectly ripe, when we know that nature is satisfied, and the wood sufficiently matured to insure all requirements for another season's development.

Immediately after the leaves are fallen is the best time to prune; and as we are now considered to be dealing with vines which have had two summers' growth, cut down the cane of the present season to the same length, according to size or vigor, and likewise disbud it, as advised for the last fall pruning, which will make a total length from the bottom of nine to twelve feet. Cut the side spurs to three or four buds from the extreme base, according as they may be plump or well rounded, and at the same time peel off the loose bark from the outside of the stem which has two seasons' growth, but do not injure that which is immediately beneath the loose outer covering, nor remove any from the side spurs, or the present summer's cane. The object of this peeling is to prevent the lodgment of insects; with this exception, it would be better left on, for nature never forms any covering but

what is useful; but as this outer and loose bark is virtually dead, it is of no further use than protection against cold; so that if the vines are carefully covered from extreme frost, there is no harm in taking it off.

The vines may now be washed over with the preparation, as advised for last year, and brought down into the same horizontal position; and as it is not easy to cover the spurs, if wrapped around with straw, the better way is to have long, narrow boxes, open at the ends, or to cover loosely with marsh hay, or evergreen boughs. Let the house remain open through the winter, excepting in stormy, wet, or very severe frosty weather, and shut up the doors at night, to prevent rats or mice from getting in, as they will gnaw the bark, and do much mischief. It is a good plan to keep a cat inside.

A week or two previous to the leaves falling, fork over the borders carefully, both outside and inside; by doing it at this time, any small rootlets which may be unavoidably broken will have time to heal up before winter sets in. When severe weather is apprehended, cover over the whole surface with three or four inches of good stable manure, and add an additional layer of litter or leaves of about the same depth to prevent the frost from entering, and make "assurance doubly sure."

As the general routine of this season's practice will apply to all others, so far as the Cold Grapery is concerned, it is useless to follow this part of the subject further, than by stating (as we are treating of a set of vines in the first bearing), that the average crop may be doubled next year, according to robustness and health, which will admit of ten to fourteen pounds of grapes being taken off each, providing all are healthy. It is well to observe the progress of any which do not keep pace with the rest, and where there is a want of vigor, to ease accordingly, by not allow-

ing them to carry so much fruit as the stronger ones. A much larger weight than the above might be left to ripen under some circumstances, but, as a general rule, it would not be advisable, where permanent prosperity is desired. What is mentioned is easily attainable, and nothing is advised that I have not practically found to succeed as described. In pruning in the fall of the third season there is some difference, which will be found fully described in the chapter on pruning.

CHAPTER VII.

THE EARLY GRAPERY, OR FORCING HOUSE.

When the gardener aspires to the high attainment of modifying or improving landscape, he ought to possess the marvellous locality of the poet, and should be acquainted with those nice perceptions of light and shade that the most sensitive painter is endowed with; but when his abilities are applied to the forcing of the grape, it may be said that he puts his best practical talent and observing faculties in the most elevated position. It is true that there are many details of another character which require as much skill, and they may be as successfully carried out, but the popularity of this justly esteemed fruit eclipses everything else, and he looks with feelings of enthusiastic pride upon the crop, as he views the fine clusters hanging from his thrifty vines.

Those who are satisfied to have ripe grapes by the middle or latter end of June, need incur no very extraordinary expense, but whoever would require the same at the beginning of May, must expect to swallow dear morsels, and there are not many, excepting those who have wealth at command that will attempt it. There is, however, a growing desire to enjoy the luxury, and increased encouragement is given to the commercial cultivator in the higher prices that are now to be obtained. May we hope that this encouragement will progress, and that, although it has not hitherto been sufficient, yet it may become so great as to

bring a larger supply into market. However energetic our most scientific fruit-growers may be, and in this they are, to say the least of it, on a par with any other profession, yet it cannot be expected, that they will supply an article which will not meet with some profit. To this they are entitled by the standard of reward which is given to other attendants upon refinement, and why should there be a lack in this instance, for those who set a dish of luscious, tempting grapes before their guests at so early a period, not only show their own hospitality to the invited, but also pay a compliment to scientific horticulture, give a stimulus to the exertions of the skilful practitioner, and encourage the development of that important contributor to the country's wealth, Pomology. It has become fashionable to display a handsome arrangement of flowers on the festive board at a time when every blade of vegetation seems withered by the frigid blast; no expense is here spared, and why should it not be as much desired, to have an equally rare representation of fruit? Let Pomona and Flora meet on equal terms at our entertainments, recognize each alike, and we shall prove that we can appreciate all parts of the garden which the all wise Designer of the universe has committed to our care and keeping, and which he has commanded us to improve.

When very early forcing is desirable, it ought never to be attempted with plants that have not been previously subjected more or less to the same process. If the vines are young, they may, in the first year of bearing, be forwarded somewhat, and in the next year they will be in a fit state to be worked early. With older plants the case is somewhat different, particularly if they be spur-pruned, for there is a greater tendency to burst the buds; still, even in this case, it were better if they had been forwarded the season previous. It is often argued that the continual

forcing of the same stock weakens, and eventually wears out the plant, in consequence of which it is best to alternate; to a certain extent we may admit, that there is some truth in this, but not so much as some would seem to think; if the borders were to be kept warm, and the roots attended to with the same care as the tops, there would not be so many examples of early imbecility to complain of. True, all may be done that ingenuity can invent, and yet the exact growing temperature of summer will not be obtained—artificial heat is not so stimulating as that of the sun, but in our cloudless clime, even in the winter time, there is much bright and clear weather, which considerably assists our action, and if not quite so favorable as we could wish, it is sufficiently so to enable us, with good management and proper conveniences, to so far succeed that a house of vines will admit of being uninterruptedly forced for many years in succession, and with far more certainty than the exploded notion of resting. It is more reasonable, and much more consistent with nature, that the same periodical action should be allowed to go on, provided it is not opposed to the peculiar constitution of any particular plant, and in the case before us, there does not seem to be anything unnatural, unless the allowing of a greater length of time for the full concentration of the juices can be called such, and it is well known that the finest grapes, and most prosperous vines, are to be found in those countries which have longer and steadier summers than our own. So that, if all is well done that ought to be done during the earlier stages of development, the plants have all the remainder of the summer to mature their wood from the embryo fruit buds, and prepare for the more willing start the next season. Of course we may over-do this like most other things; as the grape vine, with the great amount of heat that we have through the

summer, and that which is given in the greatest extremes of forcing, will be subjected to as much if not more of that element than is to be found in the very hottest parts of the world, in which regions our present subject does not thrive; but in the most extreme cases, it is better to commence anew when nature is so far exhausted as to be no further remunerative, and as in establishments where this is required, there are always several houses at work, there is no difficulty in having the worn-out lot replaced by another planting.

Where grapes are required so early as above mentioned, it is necessary that the outside borders should have a share of attention, and we here take the opportunity of offering a few general remarks on this head.

If we refer to those localities or climates where vegetation prospers best, and to the most fruitful regions, we shall find that there is no great disparity in the average degree of heat between the atmosphere and the ground in which the roots of plants exist; consequently, there is a reciprocity, and an equal action, or equal quiescence over all parts. We know likewise from experience, that if the head of any plant were exposed to summer heat, and the roots in the cold of an ice house, prosperity could not long continue; in such a case, if it were positively seen, we should know the evil results that would follow, and alter the circumstances accordingly, yet strange to say, there are some men at the present day, strongly attached to planting the grape vine outside of the house, and still stranger, the same persons are more particularly so when forcing is intended; such men will argue that in this position, the roots more readily progress through the outside borders, and that it is indispensably necessary, as they have seen fine grapes grown in this way. Such logic is, however, contrary to all true physiological reasoning,

for we all know the benefit of keeping all parts of other plants in an equal temperature, or if there is any difference to be made, a gentle bottom heat under and among the roots, and also about the lower parts of the stems, conduces to healthfulness and success. Why then should the grape vine be made an exception, for it is subject to and is governed by the same laws as other parts of the vegetable kingdom, and the reason why it does not so soon resist the bad treatment which is so often practised upon it, is on account of its greater docility of constitution. For late crops the planting outside is not of so much consequence, as the natural temperature only differs comparatively little from the inside, but for early forcing, it is absolutely requisite that the stems should be in the house, and if possible, the roots ought to be kept in the same temperature as the tops. To accomplish this desideratum, some of the best cultivators in Britain cover over the borders during winter and spring, with a sufficient depth of fermenting manure, and replenish it as the heat decreases; this may do well enough where the winters are not severe, but in such a climate as the Middle and Northern States of America, the same practice cannot be satisfactorily adopted, for, owing to the severity of the weather, there would be no end to labour, and the quantity of material required; so that we ought to have recourse to other and more convenient means to accomplish the same end, if we wish to acquire the best results, and endanger as little as possible the welfare of the plants. We may get along pretty well by covering over with a good depth of tree leaves, or other like material, that will arrest the escape of the heat contained in the soil, and prevent the penetration of cold, and this will answer well enough when gentle forcing only is practised, but it is nothing more than a make-shift job for earlier crops, and answers a very poor purpose. A

better substitute, and a much more effectual plan, is to cover the border with glazed sashes, or wooden shutters, and to conduct an extra pipe from the hot-water apparatus, or a length of flue, which may be conveyed around the outside, and sunk in a cavity, so that the top may be open, and even with the surface. During the time when forcing is going on, the heat may in this way be made to circulate over the surface, and forms a stratum of warm air within the chamber made by the covering, which need not to be elevated more than six inches above the upper level of the border, so as to keep the collected heat more immediately near the roots, and by limiting the space to be heated, prevent waste. Wooden shutters are best, so far as retaining the heat is concerned, there is likewise no danger of breakage, but glass sashes have the advantage of collecting a considerable degree of caloric during sunshine, and will somewhat counterbalance the loss occasioned by its conducting properties. No doubt some persons, who may be disposed to have early grapes, may think such appurtenances very troublesome and expensive, to which we would answer, if a thing is worth doing at all, do it well, for all horticultural products are cheapest when well attended to, and such a convenience once obtained will last many years, as it may be removed in the summer season, and packed away, and the channel in which the outside heating apparatus is placed, may at the same time be covered over, to prevent any unsightly appearance, further than the row of boards or flags, as the top will be level with the surrounding surface. That good grapes have been and still will continue to be forced early without such an appendage is reasonably admitted, but is it not more in accordance with nature, to supply the roots with warmth at the same time as the branches, and is there not a greater probability that success will be more certain, and the yield

comparatively superior, besides the enabling the plants to go through the various stages of development, and after concentration, with less injury to the whole body.

As stated above, it is generally conceded that a house cannot be forced very early, for many years, without the vines becoming weak and exhausted, consequently many growers go on the plan of alternating from one house to another, each, or every other season; thereby, as they acknowledge, resting the vines. Where all other requisites are added to good culture, there is no necessity for this, for, when once a plant has been induced by forcing to break early, it is afterwards disposed to the same, and it only requires half the amount of heat to start such a plant that will be necessary for one that has not been brought the season previous to the same condition. As to the weak and slender bearing wood, it is quite reasonable that that is a consequence of the tops being unduly excited while the roots are confined in a cold base, and therefore have not the power to supply the plant with the proper juices in sufficient quantity for its own development. The best cultivators are aware of this fact, and the adoption of the above plan has resulted in the most marked success, and we have known houses which were forced year after year, produce heavy crops of fine fruit, when the borders were covered as advised above. It is not to be expected that as fine bunches or as large berries can be obtained from the earliest forcing, but that a good quality may be had uninterruptedly, is a fact that needs no further demonstration.

For the first early crop, the vines ought to be pruned in October, and if the leaves are not fallen at the time, let what are still left remain on—for, until they become fully ripe and change color the structure of the plant is receiving more matured body. Commence operations the latter

part of November, by tying down the heads of the vines as before advised, and as it is presumed that the inside borders have become very dry, give a thorough soaking of water over the whole interior, wash well into all chinks and crevices of the wood-work to dislodge insects, their eggs, or larvæ; maintain for eight or ten days a night temperature of 45°, allowing it to rise to 60° or 65° with clear sunlight; at the end of this time increase the heat for the next two weeks to 50° by night, and 65° to 70° by day, with a free use of the syringe over the vines, and keep a quantity of evaporating pans on the flues or pipes constantly filled with water. All artificial heat, excepting the open tank, has a tendency to dry the air inside forcing houses more rapidly than that from the sun, and as in the earlier stages of development, a damp atmosphere is particularly requisite, this point cannot be too carefully attended to. According as the heat is increased, let the moisture correspond—fancy a warm April morning, and imitate that as near as possible. The buds will be swelling by this time, and most likely the weather severe, when care must be used in ventilating. Our own practice in all plant culture is, not to admit any bottom air from the front lights through the winter months, being convinced from repeated experiments in different ways, and with many plants, that is one of the most injurious methods that can be resorted to. The temperature may be sufficiently lowered, and a current of wholesome air maintained, by letting the heat pass off at the top ventilators, which it is sure to do from its own reduced specific gravity, and accordingly as it escapes there is a certainty of a fresh supply being drawn in through the laps of the glass, and other apertures, which occur even in the tightest constructed houses; depend upon it the lower or front part of any winter worked house, will at all times be cool enough, without purposely introducing a

stream of cold air to pass over and among the leaves, as it traverses upwards, and forces the heat out; most of the mildew that attacks roses and verbenas in the winter time is produced by this cause, and if such plants as these suffer, surely the grape vine must share the same fate. One of the worst things that we have to deal with in forcing this fruit is the extreme difference of the outside temperature from that which is essential for its well-doing inside of the house; and particularly during its more easily injured stages, there are the most frigid blasts to contend against, and very sudden transitions, from dull or cloudy weather, to bright sunshine; owing to which it behooves us to study carefully how we proceed, and imitate as nearly as we can those peculiarities of natural climate which observation shows to be conducive to the most healthy development. This is more particularly mentioned here, because many persons are prone to take advantage of all the little opportunities that occur to admit "fresh air," without taking into consideration these principles in trying to accomplish the object in view.

So soon as the buds are well burst, the vines may be tied to the wires in their permanent position, and the heat very slowly but gradually increased; if it were possible to be so exact, about two thirds of a degree per night and one each day in clear weather would be about an average, until 65° at night, and 80° to 90° by day (according as it might be cloudy or sunshine) were arrived at. As the shoots continue to elongate, tie them to the side wires, but be careful not to commence this operation too soon, as they are very brittle, and subject to break off at the axil when young. The bunches by this time will be readily seen and as the future treatment with regard to fertilization, stopping, thinning, &c., is the same as explained in the last chapter, there is no occasion for repetition. The greatest

difference now required between this and the Cold Grapery, is, in maintaining as nearly as possible the same growing temperature, which is more simply obtained when the weather is genial; and from what explanations are given, it will only require a little observation on the part of the cultivator to carry out these instructions.

When the fruit begins to ripen, the front lights may be opened on soft and mild days, but not otherwise, for anything like a sudden check will injure the color, and stay the carbonic chemical change which at this time is going on in the fruit, by which the sugar may more or less abound, according as this action is encouraged or intercepted. It is also advisable at this exact period, that the night temperature be kept very carefully up to the average until the fruit is fully ripe; a trifle of prolonged firing more than pays for the small extra quantity of fuel and labor, by the better sample which is thereby gained.

If the outside borders are covered by glass or shutters they will require an occasional supply of water, say three or four times between the period of the fruit setting and the final swelling, which may be accomplished by lifting the covers, one by one, for the time being, when the weather is mild, and never use water which is cold for this or any other purpose in grape-growing. Have a tank large enough for all uses situated in some convenient part of the house, and keep it filled, so that what is applied may be of an equal temperature, or nearly so with the air.

When the fruit is all well ripened, it is desirable to keep a part of it for successional use, and the house may now be freely ventilated during clear and warm weather, but when fog, damp, or cold prevails, the air ought to be only partially admitted. There is no occasion to fear mildew in an early forced house, but no advantage is to be gained by submitting the fruit, or even leaves, at this

stage, to the extreme changes that frequently occur. This free ventilation will, in the course of a week or two, prepare the leaves for the full and uncontrolled action of the air, and the house may then be left open night and day throughout the remainder of the season, and there will be no further trouble than stopping the too extended growth, or an occasional thorough syringing over all parts to check the red spider, thrips, or other insects, the two first of which become a great pest to early forced vines when not attended to.

To obtain a second early crop, which may be considered to be ripe by the middle of June, or early part of July, it will be necessary to apply fire heat from the beginning or middle of February, as the case may be; and as all the details of management have been heretofore explained, the same practice, with slight modifications, will be applicable. The annexed journal, which was kept by the writer, during the progress of a house of this character last year, giving the temperature inside the house, and outside in the shade, at sunrise, noon, and ten o'clock at night—with the current kind of weather, and occasional remarks, will, perhaps, supply any deficiency that may have accidentally occurred.

DATE.	INSIDE.	OUTSIDE	WEATHER.	REMARKS.
Feb. 3d	10.60.42	17.22.15	Cloudy, with snow	House thoroughly cleansed and the inside borders well soaked with water.
4th	41.63.41	16.21.12	Clear.	
5th	41.65.42	18.38.24	Partially cloudy.	
6th	43.62.45	12.26.14	Clear.	
7th	43.62.47	14.36.24	Cloudy afternoon.	Forked inside, and covered with rotted manure.
8th	41.61.45	34.48.44	Heavy rain all day	
9th	47.70.52	35.47.34	Clear.	
10th	48.73.50	33.46.20	"	Syringed regularly overhead morning and night.
11th	46.76.49	16.21.18	"	
12th	47.71.50	21.32.24	"	
13th	49.68.55	36.41.36	Foggy all day.	
14th	51.65.58	36.40.34	"	
15th	52.66.58	34.38.36	"	
16th	50.65.54	36.41.24	Cloudy till noon.	
17th	51.75.50	20.39.16	Clear.	
18th	55.80.58	22.37.32	"	

DATE.		INSIDE.	OUTSIDE.	WEATHER.	REMARKS.
Feb.	19th	54°.74°.56°	36°.41°.23°	Cloudy till noon.	
	20th	56.71.57	26.28.22	Severe snow storm.	
	21st	52.74.56	23.36.22	Storm continued.	
	22d	60.82.61	28.44.36	Clear.	Grizzly Frontignan begin to burst the buds.
	23d	58.84.59	16.29.12	Clear, strong wind.	
	24th	57.85.60	12.38.30	Partially clouded.	
	25th	58.88.59	20.36.24	Clear.	White Frontignan and Chasselas bursting.
	26th	57.69.60	30.48.44	Cloudy, rain & wind	
	27th	55.79.59	37.45.23	Snow clear evening	
	28th	59.85.61	20.36.30	Hazy.	
March	1st	60.87.62	26.42.30	Partially cloudy.	
	2d	61.88.62	32.44.36	Cloudy afternoon.	
	3d	58.81.60	36.47.35	Foggy morning.	Hamburghs and Tokay bursting.
	4th	60.77.62	36.48.41	Slight fog.	
	5th	59.83.61	36.42.30	Cloudy morning.	Muscat bursting.
	6th	58.85.60	31.52.29	Clear.	
	7th	59.86.62	30 51.34	"	Syringing continued morning and evening.
	8th	60.73.60	36.44.38	Foggy all day.	
	9th	59.72.61	37.50.38	"	
	10th	58.73.60	37.45.40	"	
	11th	61.80.62	36.52.32	Clear.	
	12th	60.84.63	32.55.40	"	
	13th	61.87.64	41.66.54	"	Tied up Chasselas Fontainebleau.
	14th	59.87.65	43.58.42	Partially cloudy,	
	15th	61.88.65	41.66.45	" "	Tied up Frontignans.
	16th	62.90.70	47.76.53	Clear.	" Tokay.
	17th	63.89.70	41 72.48	"	" Hamburghs.
	18th	61.91.67	28.31.20	Clear, cold wind.	" Muscat.
	19th	62.92.64	22.34.30	" "	
	20th	59.87.59	28.37.17	" "	
	21st	60.89.62	21.35.26	" "	
	22d	59.81.60	25.36.30	Cloudy, with snow.	
	23d	61.83.64	31.40.28	Storm till noon.	
	24th	59.91.62	28.35.26	Partially cloudy.	
	25th	60.88.64	20.31.26	Cloudy, cold wind.	
	26th	61.87.62	27.33.26	" "	
	27th	59.87.64	23.37.24	Clear, cold wind.	
	28th	60.85.67	22.35.19	Partially cloudy,	
	29th	59.89.63	21.38.35	cold wind.	Tied side branches to wires as they continued to elongate, stopping the weakest four, and the strongest at three leaves above the bunch; syringing also attended to.
	30th	59.80.63	29.38.32	Cloudy, with snow.	
	31st	57.74.63	32.37.33	Cloudy, with fog.	
April	1st	59.75.62	33.42.29	"	
	2d	58.86.54	26.40.28	Clear.	
	3d	59.90.65	22.39.27	"	
	4th	60.83.63	30.51.40	Cloudy.	
	5th	60.91.68	38.58.40	Clear.	
	6th	59.92.64	50.77.60	Partially cloudy.	
	7th	61.93 69	56.76.59	Clear, strong wind.	
	8th	60.93.68	47.70.46	Clear.	Hamburghs in bloom.
	9th	61 95 70	52.80.43	"	
	10th	60.86.66	41.60.38	Cloudy.	Chasselas "
	11th	62.93.71	33.61.42	Cloudy, with sleet.	Frontignan "
	12th	61.96.70	32.60.43	Clear.	Muscats "
	13th	62.97.67	41.67.42	Clear.	
	14th	63.86.65	36.42.41	Hazy, heavy snow	Water over-head withheld and fertilization assisted by jerking the bunches in the middle of the day or a little before noon.
	15th	61.78.64	32.43.33	and wind at night.	
	16th	60.75.62	31.36.29	Storm continued.	
	17th	58.74.61	30.35.29	Storm continued.	
	18th	59.85.67	35.59.38	Cloudy morning.	
	19th	60 83.70	36.58.42	Clear.	

DATE.		INSIDE.	OUTSIDE.	WEATHER.	REMARKS.
April	20th	62°.86°.70	39°.57°.40	Showers till noon.	Water over-head renewed, but carefully on account of danger from "rust."
	21st	63.90.70	34.62.44	Clear.	
	22d	61.84.69	39.56.40	Cloudy.	
	23d	62.87.70	42.66.45	Cloudy till noon.	
	24th	63.92.67	36.67.50	Clear.	Commenced to thin Hamburghs.
	25th	64.95.71	43.72.56	"	
	26th	62.96.70	54.85.66	"	Do. Chasselas.
	27th	64.95.68	51.72.43	"	" Frontignans.
	28th	62.81.64	40.52.36	Rain all day.	" Tokay.
	29th	63.82.69	40.56.50	" "	
	30th	64.88.67	47.74 42	Cloudy.	" Muscat.
May	1st	63.87.64	44.71.50	Clear.	
	2d	65.92.67	52.79.55	Cloudy afternoon.	Finished thinning and forked over inside borders.
	3d	63.81.66	46.62.44	Clear.	
	4th	64.79.70	41.58.50	Cloudy & showers.	
	5th	65.88.65	41.69.55	Partially cloudy.	
	6th	64.91.66	43.55.36	Clear.	
	7th	65.92.67	32.64.44	"	Grapes begining to "stone."
	8th	64.92.66	41.68.49	"	
	9th	66.88.67	40.74.59	"	
	10th	65.89.68	54.81.59	Partially cloudy.	
	11th	63.90.65	55.81.60	Hazy.	
	12th	66.95.67	58.82.54	Clear.	
	13th	65.92.61	58.77.61	Foggy morning.	
	14th	63.88.67	57.79.59	Fog, with showers.	
	15th	61.90.65	58.84.58	Clear.	
	16th	64.97.68	58.84.59	Foggy morning.	
	17th	65.90.65	56.73.58	Fog with showers	
	18th	64.87.70	58.81.59	Foggy.	
	19th	63.91.67	57.81.56	Clear.	
	20th	65.87.66	56.78.58	"	
	21st	64.86.67	56.75.57	Cloudy.	
	22d	63.91.65	56.78.58	Clear.	
	23d	65.92.66	54.77.54	"	
	24th	62.93.65	53.74.54	"	
	25th	63.84.70	53.70.58	Cloudy.	Water over-head discontinued.
	26th	65.91.66	56.79.58	Clear.	
	27th	64.93.65	59.79.56	"	Commenced to open lower ventilators.
	28th	66.95.70	59.84.66	"	
	29th	64.93.65	54.73.56	"	
	30th	65.90.67	57.71.56	Cloudy.	Grizzly Frontignan begin to color.
	31st	66.91.71	56.72.58	Clear.	
June	1st	64.90.68	47.72.48	"	Chasselas begin last swelling.
	2d	66.99.61	48.82.54	"	
	3d	67.91.68	57.81.62	"	Water entirely discontinued.
	4th	66.92.71	59.82.65	"	
	5th	68.61.69	61.89.66	"	
	6th	67.92.68	61.82.63	"	Hamburghs begin to color.
	7th	66.90.67	61.78.66	Cloudy afternoon.	
	8th	68.92.66	62.85.64	Misty till noon.	
	9th	65.90 64	60.72.57	Clear.	
	10th	68.91.70	61.84.64	"	Muscats begin to color.
	11th	69.92.69	64.88.63	Hazy.	
	12th	66.93.66	61.83.64	Thunder Storm.	
	13th	69.91.65	64.86.63	Showery.	
	14th	68.93.67	62.88.60	Thunder showers.	
	15th	67.92.68	61.86.66	Showery.	
	16th	66.91.64	65.81.60	Clear.	
	17th	64.92.63	60.72.58	Hazy.	
	18th	65.92.71	57.91.70	Clear.	

DATE		INSIDE.	OUTSIDE.	WEATHER.	REMARKS.
June	19th	69°.94°.69°	65°.96°.68°	Clear.	
	20th	72.94.73	71.95.74	"	Cut Chasselas Fontainebleau, ripe.
	21st	73.93.65	71.90.61	Cloudy afternoon.	
	22d	71.92.64	68.72.61	" "	
	23d	65.87.63	60.73.61	Cloudy with rain.	Cut White Frontignan.
	24th	66.90.63	57.81.60	Clear.	Cut Grizzly Frontignan.
	25th	65.91.62	58.77.58	"	
	26th	67.93.69	59.82.68	Partially cloudy.	
	27th	70.97.69	65.98.66	Thunder showers.	Cut Hamburghs.
	28th	68.91.73	68.85.72	" "	Cut Cannon Hall Muscat.
	29th	71.93.68	68.86.65	Clear.	Cut Muscat of Alexandria.
	30th	64.87.71	58.81.70	Cloudy with rain.	

After this time the house was kept open at all times, excepting during very strong winds, or severe storm, and an occasional soaking of water was given over the leaves to destroy insects and keep up a healthy action.

CHAPTER VIII.

POT CULTURE.

THE growing and fruiting of the grape-vine in pots or tubs is, in some parts of Europe, very much practised at the present day, and some of our best practical men in this country are in favor of its being more generally adopted.

As this mode requires the most vigilant care, we must consider the annual amount of labor incurred in watering, potting, and other attention which is required, besides the expense of pots or tubs in which to grow the plants, and also the continual raising of fresh stock. On the other, or credit side, there is the difference with regard to accommodation and conveniences; pot culture takes up no space outside the house; the expense of outer borders, covering, &c., is avoided; but there is a yearly item in prepared compost which only amounts to about the sum that top-dressings would require—a manure-water tank, or cistern, is absolutely necessary to supply the vines with nourishment, while growing freely; but this is a thing that ought to be on every place that pretends to good gardening. As to house-room, what will produce a given quantity of fruit by the usual mode, will do the same in pot culture; and all things considered, if sufficient care and attention can be relied on at all times, the latter mode has the preference; still it ought to be borne in mind, that without all this, a poor sample of watery fruit will be the only reward, while with it, fine grapes, of good quality, can be realized; and, considering the contingencies, it is only advisable to adopt this system as a first early crop.

If we consider that each fruiting plant in this case will occupy one square yard, which is about an average, a house twelve feet wide will accommodate three rows, and admit room for a pathway; and allowing forty feet as the length, there will be house-room for thirty-nine vines, upon each of which may be ripened six to seven pounds of grapes, which will make the whole crop from two hundred and thirty to two hundred and seventy pounds weight. If the vines were planted out three feet apart, in the usual way, the same house would contain thirteen plants to the roof, and the same number on the back wall; but as the latter will only hold good for two or three years, on account of shade, or may have been used up by previous cropping, they can only be put down as a small set-off against the advantages on the other side. These thirteen vines, if forced equally early, cannot be expected to produce more than an average of fifteen pounds, which will give a total of one hundred and ninety-five pounds. If the above calculations be correct—and we judge from practical experience in the matter—the weight of produce is in favor of pot culture; but as we would not mislead, it is necessary to repeat, that the same quality is not to be obtained without skill, and the most careful attention.

There may appear to be an objection to pot culture, from the general understanding, that when the roots of a grape-vine are confined in so small a space, it will only bear one remunerative crop, and is afterwards useless; also, that a preparatory house will be needed for succession plants; thus keeping occupied two compartments. As to the first, it is an error to suppose that a second, or even a third fruiting, may not be obtained from the same plants, if the roots are allowed to pass through the bottoms of the pots into the base beneath, which ought to be made suita-

ble and fertile for the purpose. Under these circumstances, and with the addition of liquid manure, there will be enough organized matter stored up for another season to maintain and develop all the next year's requirements. But allowing that only one fruiting could be realized, it is presumed that the crop would be ripe by the middle of May at the latest, and either all cut, or fit for removal to another and cooler apartment; and as in such case the plants would not be wanted again, the roots that may have gone into the base below might be cut off, without any detriment to the quality of the fruit. The young succession plants previous to this will have been only in a state of propagation, and have occupied no more space or head-room than a tolerably deep hot-bed frame would furnish; so that, after the flooring of the house is again forked over, and a quantity more manure added, this young stock may be brought in, and established in their permanent position. Thus will one house, with the exception of a small pit, or hot-bed, answer all purposes, and will be kept constantly at work.

Vines for this purpose may be propagated from "eyes" in the usual way, by coiling, and by layers—(see Propagation). When eyes are used, the young plants, after being well rooted, ought to be encouraged by plenty of pot room, and a fine genial, growing temperature maintained, similar to that used for fruiting. The most suitable compost is the peeling, or upper sward of a good pasture, which has laid together until the grass is dead, but not further decomposed. Chop this into small pieces with the spade, add an equal quantity of well decomposed barn-yard manure, and if there are any clean broken bones to be had, or, what is the next best substitute, lime-rubbish, mix a quantity, say one-eighth part, and as much or more of charcoal lumps. This furnishes an open, porous, yet rich

material, in which the roots will ramify very freely. At the first move from the striking-pot an ordinarily fertile soil is best, and the pot may be a quart in measure. As the young plant continues to progress, and has grown a foot or eighteen inches in height, it will be safe to remove into one of a gallon size, using the prepared compost, and make sure of efficient drainage by throwing over the bottom a couple of inches of crocks, or, still better, pieces of charcoal; over this put a portion of the roughest of the compost, and fill in to near the top with the finer part, after having placed the plant in its proper place and position. Be careful not to break the ball of earth, during removal, when the pot is turned upside down, which may be prevented by giving the upper edge a smart rap on any solid substance near at hand, and keeping the fingers over the under surface, so as to receive the whole as it becomes liberated. After potting, give a good watering, and as the stems continue to elongate, tie them up carefully to stakes, until they have attained the height of seven feet, when the tops may be pinched off. Throughout the season the uppermost eyes will continue to push fresh growth, which ought to be stopped, each time, one leaf above the previous operation. The object of this is to prevent the young vines from extending so much growth as would cause the lower leaves to be shaded, and consequently not able to elaborate the juices sufficiently to produce matured buds in the axils, the result of which is, a deficiency in the formation of the embryo fruit. If the plants are kept in a brisk and moist heat, and properly attended to by syringing and watering of the roots, they will progress fast, and by the middle of July will be ready to be placed in the fruiting pots, which ought to be from three to four gallons, according to the luxuriance of the vine, or robustness of the variety. The same process as to potting must be

gone through at this as at the last remove, and the same material used, and particular care should be taken that no worms, or the larvæ of beetles be in the compost. It is a good plan to use a little caustic powdered lime through the mass, a short time previous to using, which is sure to have the desired effect, and is likewise beneficial to the plant. Throughout the whole summer the same treatment, with regard to heat, moisture, &c., that is suitable for planted-out vines will be right for those in pots; and if the best management has been observed, at the end of the growing season, the canes will be well matured, correspondingly thick, and in a fit state for fruiting the next year. In the fall they may be cut back, the strongest to three feet, and the weaker ones to two feet six inches above the pot, and if there be a portion that are not strong enough to bear fruit, it is best to head them back to the lowest good bud at the same time. These latter, in the spring following, may be removed out of the pots, and the soil shaken from the roots, which ought to be somewhat shortened in, and the plant again replaced, using fresh compost of the same kind, with the exception of a small quantity of good, fresh earth, but only sufficient of this to merely cover the roots, and keep the richer material from coming in close contact until the young fibres are emitted. Young, healthy roots will push into and luxuriate in a base that would destroy those which are mutilated; hence the caution.

When the coiling method is adopted (see Propagation, page 133), the fruiting-sized pot may be used at once, and the after treatment will be the same as for the others. This is the best method for obtaining strong vines for pot culture in the least possible time, and when there is a surplus supply of canes from other houses at pruning time, they may be used to advantage for this purpose.

A pot-vine, if properly managed, is certainly a pleasing

and very pretty object, but much depends upon the nicety of training. To gain this advantage, the plant ought not to be longer than is actually necessary, and the fruiting branches should be as near the surface of the pot as is consistent with securing good plump buds to start from, which can be mostly gained with a cane of two feet six inches to three feet long. After it is seen which shoots will produce the best bunches, choose six or seven which are nearly equidistant from each other, between the top and bottom, and as they elongate tie them out horizontally, diverging on all sides from the stem, which may be very neatly done by fixing a wire trellis, as seen in fig. 15, inside the pot. This is also serviceable to suspend the shoulders of the bunches to, and if not made of too heavy material, is scarcely visible, being decidedly preferable to a display of wooden supports. It should, however, be put over the plant before much growth has progressed, or there is danger of breaking the young shoots.

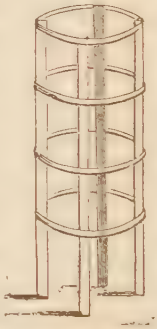


Fig. 15.

When the plants are to be fruited more than one season, the double spur method, page 117, is best, as it gives a greater choice of good buds,—a matter of some consequence when the wood is not over strong, and under these circumstances the bearing shoots may be cut clean away so soon as the fruit is cut, which admits the light and sun to the remaining leaves on the maiden spurs, thereby enabling them to have full scope, and uninterrupted freedom during the after part of the summer. Immediately after the leaves are fallen is the best time to prune, and at the same time, the roots that have gone into the soil below may be cut away, the pots cleaned, and the vines washed over with the mixture, page 65. Let all now go

quietly to rest for a time by keeping a low temperature with plenty of air night and day, and only giving enough water to prevent the roots and branches from shrivelling. Two or three weeks before commencing afresh, the plants ought to be carefully turned out of the pots without disturbing the balls, the roots examined, and any decayed portions cut clean off; at the same time take away a portion of the outer soil, and after putting a good quantity of drainage into each clean pot, again place the plant as before, filling in with some of the before-mentioned compost. Before they are again placed in their permanent situation, let the under base be forked over, and some more decomposed barn-yard manure added.

When growth is progressing freely, at all times, from the showing of the fruit until it is ripe, clear liquid manure ought to be applied; on this, in a great measure, depends success, or the best of quality. Each third or fourth supply of water should be, either diluted drainage from the dung-hill, or guano dissolved, in the quantity of one ounce to the gallon, and if these two are alternated it is still better. The remainder of the treatment required is the same as for other culture, and if the above directions are observed, there is no fear of failure.

CHAPTER IX.

THE RETARDING HOUSE.

The object of the Retarding House is the reverse of the Early Grapery. In the latter we wish to forward as much as possible the ripening of the fruit, while in the former, the intention is to retard it so far as can be done. It is therefore evident that the two features require very different management; in fact, in one, the process really and truly speaking, if judiciously applied, gives to the vine the requirement of its own or original constitution, by the assistance of artificial heat at the time when the plant is best able to be benefited by it, while the other has the same applied, only to keep out the frost at mid-winter, and to create a dry atmosphere when the fruit is hanging ripe, for the purpose of preserving it.

From what has been previously explained, it will be readily seen that some difficulty must occur, when we are trying to carry out in cultivation anything that is opposed to nature, or attempting to thwart her established vitality; such becomes true here, for, our intention is to stay as much as possible that free and brisk action which alone will ensure the best results, notwithstanding which, as we have an object in view, and the demands of luxury *must* be supplied, our skill is brought into requisition, and to a certain extent the difficulty is overcome.

The general routine, in this case, will be the endeavor to keep back the precocity of the fruit by all consistent means —one of which is to avoid the very earliest varieties; an-

other, securing the right aspect of the house, which is fully explained, page 37. It is also essentially requisite to give free ventilation, both day and night, excepting in severe weather, during the whole of the spring months, by which a cool temperature may be maintained, and the early flow of the sap prevented. When it is seen that the buds can be no longer kept from bursting, the house may be closed, but as it is not advisable to raise so high a temperature in this, as in the other successions, there ought not to be so much water applied, because, if it be too liberally supplied in this counteraction of the natural energy, there would be too much moisture absorbed from the atmosphere by the leaves, and from the soil by the roots; the consequence of which would be too great a preponderance of fluid matter, without an equivalent amount of carbonized and solid material, and hence, a plethoric state of the whole structure—a liability to disease—want of fertility in the blossoms—a bad set of inferior berries—and consequently, poor quality of badly flavored fruit. Water may, however, be administered with discretion. According as the growth progresses, as it is more or less active, or the weather is wet and cold, or dry and hot, so let the water be given or withheld. When the leaves are fully developed, the shoots stopped, and the blossoms expanded, syringing may be entirely discontinued, excepting occasionally on bright mornings, for, unless due caution be exercised during the remainder of the growing season, there is danger of mildew. This troublesome guest is more likely to attack the Retarding House than any other, and consequently, greater vigilance is necessary. It is most generally to be apprehended while the fruit is swelling, and before the carbonaceous matter has become so far concentrated as to be relieved from the greater overplus of acidity; and as the secretions of the plants in this house

are in such a state; during the months of July and August, when the sporules of the fungus are most active, it is very necessary to keep careful watch, and avoid as much as possible all sudden transitions of temperature; do not allow the house to be closed until it becomes hot, but admit air freely whenever required; be wary of bottom drafts, keep the lower ventilators closed in damp weather, and if such continues for any length of time with a humid atmosphere, a little artificial heat may be applied for the time being, with the upper ventilators opened, which will keep down the thermometer, dry the air, and stay the progress of the mildew if it be present, or prevent its germination if not so. Sulphur aught to be liberally strewed over the floor for the same purpose, and if a small quantity be thrown on the flue, avoiding the *hottest end*, or on any part of the hot water pipes, as the case may be, there need not be any fear of its ravages extending. Another mischief to be expected at times to this crop is, shrivel and shanking, the best means of avoiding which is to continue the same regularity of management that has been observed through the whole progress, and until the fruit is colored; after this period there is no danger, and the house may afterwards be left open constantly, or partially, or entirely closed, as the weather may be wet or frosty. A portion of the grapes in this house will have to remain on the vines during the winter, and must be kept quite dry and free from frost, which makes it necessary to use a trifle of fire-heat at times, just enough, but not more than, to answer the purpose; and if the berries were not well thinned at the proper time, they ought to be further reduced in number now, so that they may hang loosely, thereby preventing close contact, and admitting a free circulation around each.

As the fruit often remains beyond the usual time of

pruning, it is well not to make a general rule of cutting all at once, or leaving the vines until the crop is cleared, but do it so soon as the leaves are turned yellow, or fallen; and the whole of the fruit is gathered on each separate plant, which will enable the operator to accomplish a good part of this work sooner, and give a portion of the stock a better chance of the same action that we always find of service, by a periodical and judicious pruning in all other instances. This is more strictly applicable where the spur method is adopted, but is nevertheless to be recommended for the long rod, as the latter offers greater facilities than the former, because there is a less disposition to break or burst the buds, with a young and strong cane in early spring, than with spurs; and as the whole of the previous bearing shoot is taken away, there is only one cut exposed to the danger of bleeding; a subject of some importance, if the fruit has been kept on the vine until late. In such case, immediately on removing the branch, the severed surface should be covered over with a coating of grafting wax, white lead, or, what is still better, finely powdered oyster-shells and cheese, worked together into a thick cement, and a portion rubbed well into the exposed pores. This, we repeat, ought to be done *immediately* after pruning, and all danger of bleeding will be avoided. It is of little use to attempt to stop the sap after it has commenced to flow, for there is a propelling power in the action of a plant at this time that is truly wonderful; and although there is not so much injury from the loss of a portion of the fluid as some persons would have us believe, still it is better to prevent the waste, for it certainly does check, to some extent, the full burst of nature, as we have often satisfactorily proved.

It may be thought, from the preceding caution, and seeming uncertainty, that the Retarding House ought to be

abandoned; so it ought, were it not for the desirableness of having ripe grapes at mid-winter, and before the earliest house can be made to produce them; and it certainly is, these advantages considered, worth a little trouble and extra care.

In taking a review of the various succession crops heretofore treated on, we may now calculate how long it is possible to have ripe grapes fresh from the vine. The First Early can be had from the beginning of May, and will continue to the middle of June, when the Second Early will be ready, and give a supply until the middle of August. The Cold Grapery now comes in, and will furnish a general quantity till the middle of November; after this, the Retarding House gives its quota on to the last of February, which collectively leaves only two months deficient, or without a supply; and as there are some kinds, as the Muscats, Frontignans, and Chasselas, that may be preserved by care, and if it is absolutely required, even in this remaining short period, a far better sample may be furnished than is to be had from the finest quality of imported raisins; so that, where expense is no object, and the luxury is demanded, it may be enjoyed without intermission.

If the air of the grapery be kept dry enough, some grapes will remain good on the vine until they become raisins; but it is not convenient at all times to leave them so, and in such case, those that are to be preserved may be cut when they can no longer be left When they are removed, the bunches ought to be carefully examined, and all injured or decayed berries cut out, and suspended, the reverse way to that in which they were grown, by hooked wires fixed to a frame-work, so that each bunch and berry may hang free from contact, and they will require to be kept in a very dry room, partially excluded

from the light, and where there is enough fire at suitable times to keep the temperature from 40° to 50°. A well-planned fruit-room is all that is needed, and where there is not such a convenience, the above hints may assist in directing attention to some other apartment about the premises that will answer the purpose, and enable the lover of this ambrosial fruit to enjoy to the fullest extent this munificent gift of our benevolent Creator.

CHAPTER X.

LIST OF VARIETIES.

To begin to individualize, or render a plain exposition to the uninitiated in grape nomenclature, is a very difficult affair. As it now stands before the public, it is nothing more than a heterogeneous jumble of confusion, and the search after a thoroughly practical understanding of the matter requires more time, patience, and expense, than even the enthusiast would be willing to encounter in the investigation, if he only knew beforehand the maze he had to travel through. To such an extent have the various synonymes become multiplied, that the examination of them shows clearly the ridiculousness of the number, and the only way of extricating the subject from the tiresome burden of incongruity, is by making use only of a few that we know are most familiar in the society in which we live, and only introducing such kinds as are distinct, or worthy of cultivation, headed by the most popular name by which it is known in our midst. It would be no difficult matter to introduce and describe some hundred so-called varieties, but when they were applied for, and obtained, which they might be from the various nurseries in our own country and Europe, the half of them would prove to be merely duplicates,—nay, we will go further, and assert that not more than a fourth, from some places, if thus sought after, will be really distinct; besides, were the expected variety to be forthcoming under such circumstances a great portion are only novelties and would lead to chagrin and

vexation when they were proved. We take in this case a utilitarian view of the subject, and would leave the further action open to those of unlimited means and uncontrolled enthusiasm to go along with their own fancy. They cannot be better employed, and the results of their labors will be of the same national benefit as is that of the *only* theoretical and experimental farmer; good collectively, at the expense of the individual, and praiseworthy, without profit, to the searcher after progressive improvement. It is to the exertions of such laudable persons that we are indebted for much of our knowledge and gain, and such deserve more often than they receive the gratitude of their fellow men and a monument for their patriotism. Having said thus much, it becomes our duty to keep our position, and give in the first place a general descriptive list of the best sorts in cultivation, and select out of the same those varieties that are adapted to the various purposes treated on.

BLACK OR PURPLE.

Black Hamburgh. (syn. *Hampton Court Vine—Frankendale.*)—Bunches large, compact and well shouldered. Berries large, round, black, flavor full and sweet. The best black grape grown for table use.

Victoria Hamburgh.—Similar to the above when true; the berries somewhat larger and very black, and the bunches more tapering.

Wilmott's Hamburgh.—Bunches very compact, berries large, very black, round, appearing (under good culture) as if hammered on the surface; a fine grape, but not quite equal to the first in flavor.

Wilmott's No. 16.—A seedling from Black Hamburgh, and so like it as scarcely to be distinguished.

Miller's Burgundy. (syn. *Miller Grape.*)—Bunches

short and close, berries roundish oval, black, rather small, covered with a blue bloom, flavor not good until fully ripe. An early variety of second rate quality for the grapery, but suitable for out-door culture. The leaves of this sort are pubescent, hence its name from the white downy appearance.

Black Cluster. (syn. *Black July.*)—Bunches small and clustered; berries jet black, small, flavor sprightly but wanting in fullness, one of the very earliest kinds, but not worth room in the grapery. The leaves of this are free of the downiness mentioned in the last.

West's St. Peters. (syn. *Black Lombardy—Poonah—Raisin des Carmes.*)—Bunches medium size, long, tapering, well shouldered; berries medium size, oval, very black, covered with a blue bloom, very sweet and sprightly; a fine late sort.

Mitchell's St. Peters.—Similar to the above, but a handsomer bunch and berry.

Zinfindal.—Bunches long, peculiar in form, being sometimes composed of two shoulders, berries roundish oval, black, sweet, but tame, a good hardy sort.

Black Frontignan. (syn. *Black Constantia—Black Frontignac—Muscat noir de Frontignac.*)—Bunches below medium size, tapering, small shouldered; berries not large, round, black, musky and sweet, a good grape, but bad to color, and in some houses subject to shank.

Black Prince. (syn. *Cambridge Botanic Garden—Alicant.*)—Bunches long, tapering and well shouldered; berries a little above medium size, oval, black, very sweet and sprightly, a first-rate sort.

Scharge's Henling.—Bunches long, tapering, and clustered; berries small, oval, very black, sweet and brisk; pretty in form, and a seedling from the Burgundy.

Black Tripoli (of Speechley).—Bunches in form like

Hamburgh, but rather loose; berries large, black, flavor good; useful as a late grape.

ESPERIONE. (syn. *Cumberland Lodge—Blue Windsor.*)—Bunches large shouldered; berries medium size, black with fine bloom; pretty, but second rate.

PRINCE ALBERT. (syn. *Royal Albert.*)—Bunches large, heavy shouldered, and tapering; berries medium size, round, black; flesh solid, sweet and sprightly. This is a very strong grower, and shy bearer, except in poor soil, otherwise it is a first-rate late sort. We are inclined to think that the Black Barbarossa will prove the same as this.

BLACK MOROCCO. (syn. *Black Muscadel.*)—Bunches large and heavy shouldered; berries large, ovoid, brownish black when fully ripe, flesh solid and only second quality; a very late grape, and with fire-heat tolerably good.

PURPLE FRONTIGNAN. (syn. *Purple Constantia—Blue Frontignan — Voilet Frontignan.*) — Bunches long and tapering with small shoulders; berries medium size, *blue black*, flavor slightly musky, and agreeable. This grape and the *true* Black Frontignan are so generally mixed up in different collections, as to frequently lead to disputes in their individual identity; our own observation inclines to distinctness of the two sorts, the *black* scarcely ever colors further than a brownish jet; while the *purple* assumes a true bluish-black, even with ordinary culture. The former has also a stronger musky flavor, and will hang until they become raisins.

OLDAKER'S ST. PETERS. (syn. *Black St. Peters—Black Palestine.*)—Bunches somewhat like Hamburgh, but loose, berries rather large, round, black; flavor sweet; a good late grape but not a very free bearer.

WHITE AND AMBER COLORED.

CHASSELAS DE FONTAINEBLEAU. (syn. *Chasselas precoce—White Chasselas—Royal Chasselas—Chasselas de*

Bur Sur Aube.)—Bunches tapering, well-shouldered, medium size; berries round, medium size, amber-white; flavor sweet and full. One of the most reliable and early of white grapes, and the very best quality.

MALVASIA. (syn. *Grove-end Sweet Water—Early White Malvoise.*)—Bunches rather below medium size, small shoulders, tapering; berries greenish-amber, below medium size, roundish oval, transparent, very sweet; a good early kind.

GOLDEN CHASSELAS.—Bunches long and tapering; berries medium size, round, yellowish-amber color; sweet and sprightly. With fire heat this is a good grape, but in the Cold Grapery it is often a bad setter, and is at all times somewhat uncertain.

ROYAL MUSCADINE.—This grape is often considered to be the same as Chasselas Fontainebleau, although quite distinct. The bunch of this variety is much larger, and the color more inclining to yellow. It is seldom seen true; the last named being often substituted for it.

CHASSELAS MUSQUE. (syn. *Muscat Blanc Hatif—Joslyns St. Albans.*)—Bunches medium size, tapering; berries round, flattened on the end; amber-white, musky, rich, and very sweet; a free bearer, and one of the finest grapes in cultivation; it is, however, very liable to crack, if not well ventilated, and more than usually subject to shrivel.

WHITE GASCOINE.—Bunches rather large, well-shouldered, tapering; berries oval; white, flavor good. Subject to crack sometimes in a damp house. A good sort.

VERDELHO. (syn. *Madeira Wine Grape.*)—Bunches rather small, loose; berries medium size, oval, yellowish-green, sweet, and pleasant; a good variety and vigorous grower, but not a very free bearer.

WHITE TOKAY. (syn. *True Tokay—Tokai Blanc.*)—

Bunches long and compact; berries roundish-oval, medium size, white, sweet, and pleasant; a fine sort, but subject to shrivel when growing in a wet border.

WHITE FRONTIGNAN. (syn. *White Constantia—White Frontignac—Muscat Blanc.*)—Bunches below medium size, long, small shouldered; berries medium size, round, light amber, musky and sweet; a fine early sort.

DECON'S SUPERB. (syn. *Sahibee.*) — Bunches rather large and handsome; berries large, oval, amber color, appearing as if frosted over the surface. This is a splendid looking grape, but of second quality; and in a cold house often a bad setter.

WHITE NICE. (syn. *Xeres.*) — Bunches very large, and many shouldered; berries medium size, round, amber-white, sweet, and *sherry* tasted. A fine sort, and occasionally most extraordinarily large. It has been grown to nineteen pounds weight, but such bunches are only exceptions. Many Spaniards to whom we have shown this grape, recognize it as the one from which sherry wine is made.

SYRIAN.—Bunches very large, and heavy shouldered; berries large, slightly oval, white and sweet. If we have at the present time any grape in cultivation which is the the one brought by spies out of the land of Canaan, this is the most likely sort. It is always large, and sometimes very heavy; a fine late kind.

WHITE LISBON. (syn. *White Hamburgh—White Portugal.*)—Bunches sometimes large shouldered, large and rather loose, but when well grown very handsome; berries oval, white, large, solid; flavor sweet, but only second rate. This is the grape that is imported from Europe in jars. It is a fine sort for the Retarding House, as it keeps well and ripens late.

PITMASTON WHITE CLUSTER.—Bunches medium size,

compact; berries round, white, medium size, sweet, and good flavored. A fine early sort of the Chasselas class.

Scotch White Cluster.—Very like the above.

Gromier du Cantal. (syn. *Decandolle?*) — Bunches large, broad, heavy shouldered; berries large, round, amber colored, blotched with purplish brown, sweet, and brisk flavored; very thin skinned; a good sort for immediate use, but soon spoils.

De la Palestine.—Bunches much branched, and very long, often two feet; shoulders very numerous and long; berries below medium size, oval, amber colored, very sweet. A good late fancy kind, and distinct in appearance.

Dutch Sweet Water. (syn. *Pearl Drop — Pareyl Druyf.*)—Bunches medium size, compact, and well-shouldered; in form like Hamburgh; berries large, round, transparent, white, very sweet, skin thin. A fine early sort, seldom seen true, the old White Sweet Water being often substituted.

Muscat of Alexandria. (syn. *White Muscat—Malaga.*)—Bunches handsome, well formed, and large; berries large, oval, amber colored, musky, and sweet. Unquestionably one of the finest grapes in cultivation, but requires artificial heat, particularly while in bloom.

Cannon Hall Muscat.—Very like the above, but of more robust growth, and larger berries; the bunches also are generally more tapering, and *the stamens six, occasionally seven, in number.*

Muscat of Lunel.—Like the Muscat of Alexandria, with smaller berries.

Charlesworth Tokay. — Bunches large, long, and well shouldered; berries large, roundish oval, amber-white, rich, vinous, and musky. This is a good variety, and sometimes mistaken for Muscat of Alexandria, al-

though quite distinct. The foliage of this is more deeply cut, and not reflexed on the edges.

WHITE CORINTH.—Bunches tapering; berries close set, small, very pretty, and prolific, a fancy kind.

RED AND TAWNY COLORED.

RED TRAMINER.—Bunches below medium size, shouldered and tapering; berries rather small, round, of a russety-red color; a good sort. This is one of the best wine grapes of the Rhine, and suitable in some situations for outdoor culture in our own climate.

RED CHASSELAS. (syn. *Red Muscadine—Muscadine Rouge.*)—Bunches medium size, shouldered; berries medium size, round, sweet, and good. This variety is remarkable for having the berries red from the first, and afterwards changing to a lighter shade when ripe. The wood also is of a reddish color.

ROSE CHASSELAS. (syn. *Violet Chasselas.*)—Bunches below medium size, shouldered; berries below medium, round, rose color, sweet. A good sort.

AUSTRIAN MUSCAT.—Bunches medium size, very compact; berries closely set, roundish-oval, tawny-red; skin thin. This grape is not unlike the Grizzly Frontignan either in flavor or appearance, but is not so good; and is subject to crack, but hangs long after being ripe.

GRIZZLY FRONTIGNAN. (syn. *Red Constantia—Grizzly Frontignan—Muscat Gris.*)—Bunches tapering with small shoulders, below medium size. Berries, medium size, round, grizzly red, musky, rich and sweet. A fine early grape, and hangs well after being ripe.

REINE DE NICE. (syn. *Queen of Lombardy.*)—Bunches very large, tapering, well-shouldered and handsome. Berries large, oval, irregular on the surface, rose color; flesh hard and sweet. A fine late grape, but sometimes a shy

bearer if spurred in too close. It may be preserved as long as the imported White Lisbon.

FLAME-COLORED TOKAY, (syn. *Red Lombardy.*)—Bunches very large, well-shouldered and handsome; berries large, close-set, roundish, pale red, sweet and sprightly. A fine late grape.

As most persons will only require to grow the finest quality, and many have but a limited space, the above list is reduced to the best twenty, ten, and five (including so far as can be a variety of color), as follows :—

COLD GRAPERY.

BEST TWENTY.

Black Hamburgh,	White Gascoine,
Willmott's Hamburgh,	White Frontignan,
West's St. Peters,	White Nice,
Black Prince,	Syrian,
Black Frontignan,	Pitmaston White Cluster,
Zinfindal,	De la Palestine,
Red Traminer,	Red Muscadine,
Rose Chasselas,	Grizzly Frontignan,
Chasselas Fontainebleau,	Reine de Nice,
Chasselas Musqué,	Royal Muscadine.

BEST TEN.

Black Hamburgh,	Chasselas Fontainebleau,
West's St. Peters,	Syrian,
Black Prince,	Zinfindal,
White Frontignan,	Reine de Nice,
Grizzly Frontignan,	Chasselas Musqué.

BEST FIVE.

Black Hamburgh,	White Frontignan,
West's St. Peters,	Chasselas Fontainebleau.
Black Prince,	

FORCING HOUSE.

BEST TEN.

Cannon Hall Muscat,	Chasselas Fontainebleau

Muscat of Alexandria,
Black Hamburgh,
Willmot's Hamburgh,
Dutch Sweetwater,
Grizzly Frontignan,
White Frontignan,
Chasselas Musqué,
Black Prince.

BEST FIVE.

Muscat of Alexandria,
Black Hamburgh,
Chasselas Fontainebleau,
Grizzly Frontignan,
Black Prince.

RETARDING HOUSE.

BEST TEN.

Black Hamburgh,
Black Prince,
West's St. Peters,
Prince Albert,
Reine de Nice,
White Lisbon,
Muscat of Alexandria,
Willmot's Hamburgh,
Syrian,
Flame-colored Tokay.

BEST FIVE.

Black Hamburgh,
West's St. Peters,
Reine de Nice,
Muscat of Alexandria,
White Lisbon.

POT CULTURE.

BEST FIVE.

Black Hamburgh,
Chasselas Fontainebleau,
Grizzly Frontignan,
White Frontignan,
Black Prince.

Where profit and quality combined are the objects in view, Black Hamburgh and Chasselas Fontainebleau in the Cold Grapery, and Muscat of Alexandria added in the Forcing House, will take precedence; and we may here remark, that whatever care may be taken in impregnating the Muscats, where artificial heat is not used, the *set* will be uncertain, owing to a deficiency of heat and clear weather, in some seasons, at blooming time. The

whole class requires more heat and a drier atmosphere than is necessary for any other sort; they flourish best in countries which are often too arid and hot for the successful cultivation of grapes generally. In southern Spain, and the warm and dry climates of Lima, and similar localities on the western coast of South America, they luxuriate without much care or attention, and produce most abundant crops of the finest fruit. Under cultivation, a dry atmosphere during the period of rest, and likewise at the time of the blossoms setting for fruit, is almost indispensably requisite; lacking this in the first place, the embryo flowers do not receive sufficient concentration, and a deficiency of the same in the latter instance when they expand, they have not power enough to impregnate healthily. By artificially fertilizing with other varieties, or even by their own pollen, this enfeebled condition is somewhat assisted. Where the musky-flavored grapes are preferred, and fire heat is not to be applied, the want may be made up by planting an extra quantity of Frontignans and Chasselas Musqué, which is of the same class, and one of the finest quality—quite equal in this respect to the Muscats. All of these have the good property of hanging long after being ripe, and are also early varieties. The Chasselas Musqué is faulty from its liability to crack when swelling for ripening, but a free ventilation at the time, and a drier atmosphere, will considerably counteract this evil, and when once ripe, it will continue good for a long time.

To give a long list of native grapes would be only penning a useless array of words, considering there are so few that are of sterling merit. Of late years several enterprising cultivators have done something to improve the present quality by raising seedlings, among whom are Mr. Longworth, of Cincinnatti, Dr. Underhill, of Croton Point, and others; but so far there is not much progress

to be reported. Two of the best we have at present are Isabella and Catawba, both of which are only natural seedlings; the former from the species Labrusca, and the latter, which is the famous Wine Grape of the West, most likely an accidental cross between Labrusca and Vulpina. What a wide field is there here for experiment. If we have advanced no further than what nature has done for us, surely we are only on the first step towards that perfection which the energy of the country can accomplish. The necessity of a thing has only to be seen, when ingenuity is set to work to bring about the desired ultimatum; and now we see this necessity, there is no doubt but ere long we shall have as great a variety with good quality for all purposes in the indigenous kinds, as are at present found in the foreign. This is no overstretched notion, and we are confident that it both can and will be eventually accomplished. The American Pomological Society at their last meeting came to the conclusion that the only sorts worthy of being considered best were Isabella, Catawba, and Diana, with a recommendation for further trial of the Concord. That meeting contained the best knowledge throughout the country, and our own opinion is in strict accordance with their decision; consequently it may be better to let this short notice serve for the present, with the hope that the desirable addenda will be forthcoming hereafter; and for this reason there is a chapter in its proper place on the raising of new kinds.

As the Scuppernong class is found to flourish the best in the Southern States, the few varieties contained in it may be added for that region; but these, like all the rest, are capable of great improvement; and it is very likely that if the best varieties of California and southern Texas be crossed upon them, a fine race would be obtained.

CHAPTER XI.

PRUNING AND TRAINING

THERE are various methods of pruning and training the grape-vine, and each method has had its supporters. Good crops also have been produced by many of them, under skilful hands, and no doubt will continue to be. The fact is, the grape-vine is so productive, and fruits so freely, even with very ordinary treatment, that bad indeed must be the case when it ceases to yield its luscious sweets. Yet while so submissive under ill usage, and grateful, as it were, for a common existence, like other creatures of nature's higher organization, its expansive powers will become contracted, and the tractable disposition rendered stubborn, by long continued abuse; in which case, the quality of the fruit is deteriorated, the bunches are small, or the flavor inferior; and as pruning has something to do with this, particularly the small bunches, it may be well to explain the different modes that are practised, and state the various results obtained by them.

Although it is best to allow the grape-vine, like all other fruits, to judiciously and periodically extend the superficial surface of the leaves and branches, our arrangements and conveniences do not always admit of this desirable consummation being carried out. Such being the case, it behooves us, under the circumstances, not to distort nature any more than we can avoid. In accordance with these views, first, is mentioned the plan we generally adopt.

Supposing that we have got a cane of the first summer's growth. cut it back, in length according to thickness; if very strong—say six feet, or only middling so, to five,

or even four feet; next commence at the top, leave three eyes, the upper one for the future leader, and the two others for the top pair of branches; cut out the next two, leave the two beneath, and continue on so to within eighteen inches of the soil, below which remove all to the bottom, as there is no use in having any fruit lower down. During the next summer these eyes will, if well attended to, form side spurs, which in their turn will have to be cut back to two, three, or even four buds, as they may be plump, or well developed. Now, when these buds begin to grow, we ought to have a shoot from each of them, and as only one bunch ought to be allowed to remain on each base, the other shoots will appear so far superfluous. Retain the one at the base, or nearest to the main cane, and likewise that one above it which shows the best bunch; rub off the others, and pinch out the fruit from the lower, and also all, excepting the best formed bunch on the upper one. As they progress in growth, take out the top of that which has fruit on, three or four leaves above the bunch, and let the other extend until it has unfolded seven or eight leaves; then stop it. Bring the bearing branches down, nearly horizontal, to the upright cane, and tie them to the side-wires; train the others at an oblique angle, and tie them likewise. They will now appear as seen in Fig. 16. *a* is the base shoot, and *b* the fruiting one. As both continue to push forth fresh growth from time to time through the summer, nip out to one leaf above where last stopped. After the fruit is cut, and the wood becomes ripe, say two or three weeks before the leaves fall, go over and cut (*b*) clean away to the base of (*a*), which leaves the spurs for fruiting the next year as near to the main cane as if the close cut method

Fig. 16.

had been adopted, with the advantage of having spurs which have not been burdened with fruit, and also the probability of future finer bunches, for the most prominent and well-formed buds always bring the best shaped and largest clusters, and this action gives a better chance of obtaining such. There is no fear of not being able to get shoots from the base, if properly managed; for, in most cases, adventitious buds, and generally more than will be wanted, are developed, and have to be rubbed off. When these side spurs have accumulated, and extend along the whole length to the top of the house, the leader may be cut off above the top pair, and if proper care has been taken in breaking the buds, as previously advised, there will be a uniform strength over the whole vine. If the canes have been previously disbudded, there is no danger of over-crowding, as the following year the bearing branch is brought down to the same position as that of last season, and the other one trained more upright into the vacant space.

All trees have a natural tendency to push the strongest growth to the top and extreme ends, particularly while young and vigorous; and if the side branches are very closely cut away periodically, the sap is directed more strongly upwards, the lateral force is reduced in a corresponding ratio, and the side branches are rendered weaker. This is often seen in the grape-vine, and is as often a cause of complaint. Now, the above method very much counteracts this evil, as a greater quantity of leaves are encouraged from each individual base, and, of course, a greater draw of fluid is produced into the side branches, which, when once established, remains permanent; and, so long as the same causes are in existence, the flow is equalized, the side spurs correspondingly stronger, the buds become plumper, and the bunches larger. To still

further encourage this lateral action, it is not advisable to take out the overplus buds in the fall, at the same time that the cane is disbudded, for the simple reason that the plants are collecting food, and filling up the seemingly latent parts through the winter, excepting when the whole structure is frozen, and the channels of absorption thereby stopped; consequently, all the buds receive a due share. Although a portion of this stored up nutriment is wasted, by allowing the useless buds to expand, we gain the advantage of encouraging a greater flow into the side branches until the time when the unfolding leaves are enabled to keep up the action.

Another method of spur-pruning, and the one most generally practised, is to allow the cane to extend itself upwards each season, as above described, until it reaches the top, and retain the side spurs closer and alternately arranged along the cane; each year resting, or not allowing to bear, every alternate spur, and when pruning, the cutting of all the spurs close down to one eye; or leaving those for fruiting the following season somewhat longer, and in the next fall cutting the same spur close into the cane; the object being to keep the side branches "at home." Fig. 17 shows the cane when pruned. Very good crops are often produced in this way, with otherwise good treatment; but in the first instance the bunches are generally small, and although in the latter this is for a few years obviated, still there is the disadvantage of having to cut back to the main stem, and of trusting entirely to the buds which may thus be prompted to push forth. This close cutting weakens down the lateral force of the plant's energy, in a short time the spurs become weak, and the whole cane has eventually to be cut down; by which, to say the least of it, one year's crop is lost. We

Fig. 17.

are aware, that in thus speaking of this walking-stick mode of pruning, we are going in the face of many good grape-growers; but the fact of a thing being generally "fashionable," is no criterion of its excellence. Nature's action in all these matters ought to be our guide, and the more we adapt ourselves to her laws, the more permanent will be our success.

Sometimes the long-rod method is practised. In this case, the first summer the cane is trained up as in the former modes, only left somewhat longer when pruned, and this suffered to bear a full crop the next season; after which it is cut clean out to one eye from the bottom; another cane having been taken up during the same time from its base, to afterwards take the place of the one last fruited, and so on. By this plan, which is seen in Fig. 18, fine fruit may be obtained, as the bunches emanate from strong buds, which, if they have been previously well ripened, throw off handsome and large clusters; but there is the evil of having to cut off, at one fell swoop, the half of the plant, leaving no perennial structural base, excepting the very lowest stump. This wholesale and oft-repeated cutting keeps the plant in a continual state of excitement, which is sure to eventually show itself in premature weakness. It is sometimes useful to resort to this plan, where the upright training surface is contracted, as in narrow or short raftered pits; but here it may be modified by extending and training the leading shoots horizontally a little further each season, and taking upright canes from these main branches, at the distance of two feet apart; in which case, each alternate upright may be cut out to an eye, after bearing, and another shoot be taken up the next season, to fruit in its turn, as shown in Fig 19. As the

Fig. 18.

horizontal shoots elongate, the vines which are right and left of them may be taken out.

Fig. 19.

We may also make an exception in favor of the last mentioned, with regard to vineyard culture, for it is the best of all others for the purpose, on account of the facility with which the canes can be tied to the supports, and the permanently less quantity of plants that it is necessary to congregate on a given space. And here we have evidence to prove the above mentioned assertions respecting the shortening of vitality; for a plantation trained on the single cane short-cut plan, and every season subjected to this severe lopping, requires occasional renewing. So much is this the case in some parts of Europe, that a fresh plantation of vines has to be made every three or four years. Now, as this can be prevented with so little expense or trouble, and there is a more than counterbalancing advantage arising from the system, it is well, in this particular instance, to follow what best answers the purpose in view.

The renewal method is adopted by some, which is as follows: The one year old cane is cut back to about half the length of the rafter, and allowed to bear the next season; while fruiting, the top growth is conducted perpendicularly, and at the proper time is pruned off at the top of the house; during the same summer, another cane is taken up from the bottom, and on one side, which is cut back one-half, as the other one was the previous year. The next season, this new cane is allowed to fruit, and also the upper part of the first one, the side spurs on the lower half having been cut out. Thus, there is a full crop, only each half is on two separate canes. The

youngest one is now suffered to grow, and is in its turn cut off at the top, another brought up from the bottom, and the oldest cut clear out. Fig. 20 represents the three separate canes in their respective stages. Here we have the fruit always borne on young and vigorous wood, which generally produces the finest fruit; no spurring is required, and there is the advantage of a large bulk of leaves and branches, the former of which affords nourishment; and promotes the maturity of the roots; but the tops require somewhat more side room, and the vines ought to be planted a little further apart than is necessary where spurring is resorted to. Where a vine is allotted only a certain space, this is one of the best methods of training, but it is unsightly, and if the same advantages can be gained otherwise, and at the same time beauty in appearance, it is certainly desirable to insure both. Now the first described mode accomplishes this object in the grapery and also retains a larger amount of solid structure in the form of a strong permanent stem, through which can flow an ample supply of sap to the leaves, and receive back the food, elaborated by them, down to the roots in a healthy way, and without any undue excitement to the whole organization.

Fig. 20.

But the best of all plans, and also the most natural is, to extend the head somewhat each season, so that finally, one vine may cover a large surface. Nature works by certain fixed laws which man cannot alter, and any long continued attempt to force her to swerve from her own course, is sure to end in final failure and disappointment. It cannot be denied, that much success is obtained by

modes of cultivation which would appear to speak to the contrary, but observe the ultimate results patiently, with care and without prejudice, and all these abuses will tell their own woful tale.

One of the causes why the grape vine so soon wears out, as it is generally considered to do, is produced by such close pruning as we yearly subject it to—the volume of the plants is increased for three or four years at first, and afterwards only allowed the same extent of surface. There is no other fruit-bearing plant that would continue to prosper long with this treatment; take for example a peach or an apple, allow either the one or the other to produce a long straight stem of twelve or fifteen feet, and cut in the side branches to an eye, never suffering it any further extension but what is produced in the summer—again to be cut out—and it would, after a few years' constant excitement, dwindle down to a mere stump, and finally die out. If the grape-vine does not show the same so readily, it is only because of its extremely tenacious constitutional powers, for the same law governs both, and both alike must sooner or later arrive at the same imbecile condition.

As a vine, if extended over a great space, would only admit of a limited number being grown, it becomes necessary to explain how this may be accomplished; and likewise how, during the interval, the usual crop may be secured. In planting, place in the centre of the intended row a vine of known good qualities; at intervals of about twelve feet plant others of equal merit, and fill up the vacancies with sorts as fancy may dictate, so that each one may stand about three feet apart from the next. During the first two seasons train all up as usual; so far we have elongated the surface upwards, and the canes will be near the top of the house. In pruning the second fall, as there are side spurs on the lower half of the canes

in the house, or on the whole length in the vineyard, cut these in to about three eyes. Bear each other vine the next year as heavy as it is thought advisable, so as to secure the fruit ripening and coloring well; ease the others in like proportion, which will give vigor and assist them afterwards. When the fruit is cut on those vines which have borne the heaviest crop take them out, and when pruning the others leave the side branches about a foot long, which will fill up the vacant spaces. Next year train these branches horizontally, and in the fall following, spur them as advised above, with the upright cane, and at the same time leave another length on the end of each. As these side branches continue to be lengthened and fill up more space, bear those vines on each side of them somewhat heavier, and afterwards take them out. In the course of a few years each vine will appear as seen in Fig. 21.

Fig. 21.

By this system it will readily be seen that few varieties can be grown in a limited space, but quality always gives the most permanent satisfaction, and where variety is required it may be had in the first instance and quality secured afterwards, if care is taken in planting good sorts in the right places at the commencement.

It may be thought by some persons that so few vines

are not able to carry a full crop in a given space; never fear that, for if there is sufficient surface of well-ripened wood, the roots in good order, and the expansion judiciously accumulated, the quantity of fruit may be gradually increased until a ton weight may be taken from off a single vine, and that without injury, as is proved by some which are now in existence, and are known to be over two hundred years old, among which may be mentioned the large Hamburgh at Hampton Court, near London, that has frequently borne the above weight in a season. Show me an instance where the same longevity and continued fruitfulness has been gained by the ordinary walking stick confining to one cane or short-cut method, and then I will believe that nature can alter her course, and that man's simple ideas can control the wonderful action of his Creator's intelligence.

That judicious shortening in at the right season, and under proper circumstances, is beneficial has been clearly demonstrated; we know that it tends to give vigorous and healthy growth; both theory and practice tell us so. By it we gain a stronger propelling power from the roots, without reducing their volume, or enfeebling their energy. *But to cut annually, so free growing a plant as the grapevine to a mere stump, is, to say the least of it, a barbarous mutilation of God's providence, and is sure to end in premature weakness, sappy and papery leaves, spindling ill-ripened wood, and barrenness.* By this method, last described, the roots have ample space to luxuriate in; one vine would eventually occupy and fill a whole border, which usually has to accommodate a great number, and as the head has a corresponding expansion, according to the requirements of the subject, a greater certainty of permanence and future vitality is gained. As a matter of profit it is the most beneficial, for there is surely more lasting gain where

a house or even a vineyard will continue to yield a good crop for two or three generations, than when the planting, making fresh borders, &c., has to be renewed every ten, or at most fifteen years.

In making these remarks we would not wish to be severe, for there are many persons so situated by peculiar circumstances as to prevent them from carrying out the most natural or best methods of culture, even though they may be aware of the error of their present practice, yet there are others who have popular and practical prejudices to overcome, before they will be enabled to see the desirableness of asking themselves a few physiological questions, or take the trouble to find the answers in nature's voluminous folios. May we hope that these set notions and dogmas may speedily vanish, from this free country at least, where the mutual and physical industry of man is unfettered, and where we may become a pattern to the world, in good culture, if not in artificial grandeur.

We cannot let the present part of the subject pass by without a few remarks on summer pruning, and as it may be thought that this is merely a repetition of former words, we plead the importance of the matter for the introduction. It has often been advised, and that, too, by some of the best cultivators, to stop the bearing shoots at an eye, or in some instances two eyes above the bunch, and likewise to do the same with the young cane when it has elongated to the top of the rafter, or the upright support; also to pinch out *all* laterals as they are produced, thereby making the operation into a rule. There is no doubt that many conscientiously believe such a system to be judicious, and because their crops are satisfactory to themselves, they continue on the same practice without further consideration; but this does not close up the avenue for free

discussion, neither does it prove that it is the ultimatum of perfection. If we pursue the investigation of this matter in a physiological manner, we are led to understand that all summer pruning tends to lessen the vigor, and cripple the energy of all plants; and practical experience, combined with observation, proves the fact. Arguing from this point, we may be accused of advocating no summer pruning at all, to which we say, "not guilty." If the greatest extension of branches and corresponding roots, or bulk of timber were the object, then the less pruning the better, but the present position is a consideration of circumstances and adaptability, independent, to a certain extent, of nature's action; the object being to coax her to accommodate herself to our conveniences; and as the grape vine is one of the most easily trained of her family, we have, in this case, a partial control. We ought then, to consider what we are doing, and how far we are acting in unison with what are known to be established laws, and to infringe too far upon these is sure to produce evil. This or that man's dogmatical opinion must certainly fail unless it be based upon this indisputable certainty,—where is the use of following this-should-be, or that ought-to-be, unless somewhat in accordance with these natural demands. Yet we find a prolific and luxuriant plant, such as the grape-vine is, stubbed in, cut close, and sheared like a convict,—we were near saying shaved too, for the pinching back to one eye above the fruit is nearly tantamount to that close operation. The reason given for this peculiar treatment is, that the fruit, and also the plant, is strengthened by it. How would it strengthen one's toes by cutting off a finger, supposing another would grow in its place; or would an animal produce the finer offspring if the body were to be mutilated? It is just possible that an amount of gangrene would be

the consequence; but as to truly healthful action, it is possible that we should be none the gainers. Perhaps this kind of analogy may be thought a very vulgar way of explaining what might be shown in more delicate words; but if coarse, the true meaning is purposely exhibited, to show up the ridiculousness of curtailing nature. As stated above, the subject is a matter of circumstances, we have to do with a family of plants that would occupy a great volume of surface, yet we wish to have a large number, comparatively speaking, in a small space, and the best we can do is, not to weaken down natural energy more than there is occasion for. Pruning, properly performed, and in the right season, is certainly of great service; we find it so practically, its good effects are everywhere to be seen when it is adopted; but so far and no further is it advisable. If proof be required of the injury that may be done by too close stopping, let any one try the experiment of pinching in closely the side shoots of a part of his vines, and leave the others several joints longer, and he will find at the end of the growing season that those which were left the longest are better ripened than the shorter ones, providing the light has had equal influence on both. If the vines are no further apart than three feet, the distance will allow a shoot on each side of fifteen to eighteen inches, upon which there may be from seven to eight leaves; and allowing the fruit to be on the second or third joint, there will still remain four or five leaves above it, each of which will do its duty in elaborating the crude juices, and assimilating the carbonic acid absorbed, thereby adding to the bulk and solidity of the whole structure; and if so, increasing the amount and greater firmness of the roots; for, according to the amount and action of the foliage under favorable influences, so are the underground extremities encour-

aged. As stated elsewhere, the grape vine is a plant of great longevity; notwithstanding which, with the practice of some *vignerons*, it is considered to be worn out in a few years, and fresh plantations have to be made periodically. This may in vineyard culture answer the particular purposes of the cultivator, and by the method of only allowing a few feet of bearing surface to each individual, a great amount of fruit, and suitable quality for his purpose, may be obtained from a limited extent of land employed. Here is evidence that too much curtailing of the plant's natural disposition shortens life, and weakens down the constitution to such an extent as to make it worthless, comparatively speaking, in a very short time. Considering that there is not a very great expense in replanting a vineyard, the means may be said to justify the end, but when we come to the outlay incurred in erecting glass houses, preparing borders, &c., it behooves us to think well how we can pay back a permanent interest on the capital invested, and if there be any method that will keep a house of vines in healthy bearing for a long time without the requirement of renewal, surely it must be wisdom to adopt it. If the grape vine is a long liver when allowed to extend, and soon worn out if kept in small compass, is it not reasonable, if we wish permanency, that all the available space that we have in the superficial area of a house should be covered with healthy leaves, in order the better to concentrate and store up the food for future development, and add each year a fresh layer of well organized alburnum to the previously existing sound vascular tissue? If we take further into account the glutted preparations that are often compounded for vinery borders, and the consequently immense encouragement given to luxuriant growth, it really appears surprising that such close cutting in as is generally practised

does not either kill, or cause disease in less time than is the case, and it is just possible that the present ravages of mildew in Europe have been accelerated by this cause. Such are the writer's ideas upon the subject, and as the present object is to enlighten the learner, they are submitted to approval or censure, as each practical and successful cultivator may think fit, with the conscientious belief that such is more becoming the present age of progress, and if followed up would be the means of prolonging the healthfulness and fruitfulness of the grape-vine.

CHAPTER XII.

PROPAGATION AND THE RAISING OF NEW KINDS.

THE grape-vine may be propagated from Eyes, Cuttings, Layers, Seed, and by Grafting,

EYES.—An Eye is a short portion of a branch having only one bud, Fig. 22. This method is most commonly made use of for increasing the exotic varieties, and is equally applicable to the natives; it is the best for all purposes, where there is the convenience of a glass frame or hot-house. The process is as follows: Any time from the beginning of February to the last of March take well-ripened yearling branches, and cut into as many pieces as there are buds, so that one remain to each portion; reduce the wood above and below, by a slanting cut, diverging from the bud on both ends; have in readiness as many pots, propagating pans, or shallow boxes with holes in the bottom, as may be needed, throw in an inch or two of small lumps of charcoal or broken crocks; over this, place a layer of moss, and fill up with soil, of loose but moderately fertile texture; make it somewhat solid, and press the prepared buds into it, an inch apart, so that the tops be level with the surface; place them in a gentle hot-bed, or a house where a night temperature of 55° to 60° is maintained; keep the earth moist, but not too wet, as the young shoots when they begin to protrude are liable to be injured by

Fig. 22.

dampness. For the same reason, if a hot-bed be used, great care should be taken that there is no accumulation of rank steam, or condensed moisture. In five or six weeks they will have elongated an inch or two above the soil, when they may be potted off singly into half-pint pots, and still retained in the same or a similar situation. When they have grown some five or six inches more, these pots will be filled with roots, and the plants may be transferred into those of quart size, which will be sufficient for the season, if only stocky plants for future planting be required, but when the intention is to make strong plants for fruiting next year in pots, it wlll be requisite to remove from time to time, according as they progress, into gallons and two gallons. The shoots will also need to be tied to stakes as they continue to grow. If healthy stock is wanted it will be necessary to place the plants, during the summer, in the same growing temperature as is recommended for fruiting vines, and by care and encouragement these young canes may be extended to twelve or fifteen feet long; it is however desirable that the tops should be nipped out at the height of about six feet, which will prevent crowding, and allow the light to act more freely on the lower leaves, which in their turn mature the buds on each axil. As stated above, this strong growth is not necessary, unless for pot culture; for a small well-ripened vine, with plenty of healthy roots, is quite as good for permanent planting, and with after good management will make headway equal to a stronger one.

Cuttings.—A cutting as generally understood is a length of the last season's cane containing several buds, Fig. 23. To propagate by this plan proceed as follows: So soon as the ground is in good working order after the breaking up of winter, dig, and break up well with the spade, a sufficient plot for the quantity intended; string a line across one

end, cut a trench about six inches deep, prepare the cuttings as shown above, and place each six inches apart against the bank so formed; leave one or two eyes above ground, press the soil tight to them, and afterwards level with the spade; eighteen inches from this row open another trench, and so proceed until all is done. If the season should prove dry before the roots have got sufficient hold, it is advisable to use water; and if such be required do not dribble, but give enough to soak down, that the earth may be moistened below. One application in this way will do more good than a dozen sprinklings, which only bake the ground on the surface, without any benefit. This method is the most economical, and all things considered, it is the best for the hardy kinds, for which alone it is suitable.

Fig 23.

Another mode of increase by cuttings, technically termed *coiling* is to take a length of cane, say from three to four feet fong, and coil the lower part around on the inside of a large pot, which is afterwards filled up with earth (such as is recommended for fruiting in pot culture), leaving a few eyes above the top, Fig. 24. This is of service only when strong and vigorous plants are wanted in the least possible time for pot culture, and when there are any long prunings to spare, it is the best method that can be adopted, but it is only in such cases that it is of any use.

Fig. 24.

Layers are branches of the plant bent down, a part of each being covered with earth while the base remains attached, Fig. 25. These layers throw out roots and may be afterwards cut off from the mother

plant. The most common process is to merely cover with soil, leaving the ends protruding, any time from the fall of the leaf until the rise of the sap, but as there is a "best" in all things, so in this, and we may as well show it. Early in the summer, when the young growth has

Fig. 25.

attained to the length of six or eight inches, bring down the branch intended to be laid, cover the whole length to the depth of three inches, and peg it down, leaving the tops that were the previous laterals above the soil; during the summer roots will be emitted at every joint, and of course there will be as many plants as there are shoots. The same operation may be performed any time up to the middle of July, but if sooner done, a better stock of good and well-rooted plants will be the result. It sometimes so happens, that an increase is wanted from some favorite or new variety that may be in bearing and trained in the grapery, without having to wait so long as the more ordinary methods require. In such case, one or more of the side branches may be drawn through the bottom of a flower-pot, the hole of which has been made large for the purpose, or the pot may be divided into halves and again fixed together by a copper wire; at the same time a sharp knife should be passed round the stem

Fig. 26.

inside so as to sever the bark, but no deeper, which will facilitate the emission of roots: the pot may be then filled up with earth, and suspended in a very convenient position, and if kept moist will soon be filled with roots; after which it may be cut away and treated as other stock. Fig. 26 is an example of this kind of layering.

Grafting can be only considered as just coming within the scope of propagation, the object being not so much to increase the number of plants, as the changing or one kind on to the root or stock of another. It is generally adopted to obtain a superior or more favorite variety than the one that is occupying some particular spot, and has been recommended as capable of increasing the hardiness of the future plant, providing that the stock is of that nature; the theory being, that a hardy sort imparts a portion of its character to the new parts. There is no doubt some advantage gained by the process, but it must not be put down for certain that a native root will so far alter the constitution of the exotic as to make it prosper out of doors under all circumstances, and in all situations where the former would thrive, all that will or can be gained is the greater hardihood of the roots, which may in some cases give a more steady or uninterrupted flow to the branches, and consequently a better chance of resisting that bane to the exotic grape-vine, the excessive climatic changes. It is a method that is of no service excepting for the above reasons, as young and healthy plants will answer a better purpose generally.

As the grape-vine is subject to "bleed," if cut early in the season, and does not do so after the leaves are expanded, it is necessary to defer the operation until growth has somewhat progressed; or, rather, it gives the greater certainty of success. And as the same heat that excites the stock into activity will also start the intended scions

it is requisite to keep the latter in a cool but damp place. Where there is an ice-house, they may be laid on the inside upon the covering, or, in want of that convenience, they should be buried beneath the soil, in as cool a place as can be found. There is no occasion to enter into a scientific disquisition on grafting, or to explain the various methods of doing it; our object is gained in this case, if the best be illustrated. Cleft grafting is, perhaps, the most suitable, while it is also the most simple, and is as follows: When the shoots have grown some eight or ten inches, cut off the head close to the ground, smooth over the top, and with a knife or sharp chisel cleave down the stem about two inches, put in a wedge to keep it open for the time being, and cut the graft to fit, making a notch where it rests upon the stock, to keep it firm; if two be fixed in the same way, only each on opposite sides, there will be a double chance of certainty, when, if both take, the weakest may be cut out. Care must be used in fixing the graft, that the bark unites with that of the stock, for on this nice point all success depends. Take out the wedge, and wrap around with soft woollen yarn, or bast-mat; cover over the top of the stock, and to a little below the graft, with grafting-wax, or moistened clay; afterwards heap over the whole a portion of soil, so as to form a small mound, leaving the top of the graft uncovered. Fig. 27 shows (*a*) the scion, (*b*) the stock, and (*c*) both, after the operation.

Fig. 27.

Another way, termed *Side-Grafting* (fig. 28), is to cut in a slanting direction, one-third through the stock, and prepare the graft to fit wedge-form into it, care being taken that the bark of both fits exactly on one side; the tying,

&c,, is the same as in the former case. This is somtimes useful when it is desirable to preserve the head, and perhaps the fruit on it, for the season; but the newly-introduced part does not often get strong during the time, and, on the whole, there is no advantage gained.

Fig. 28.

Inarching is sometimes practised (fig. 29), which is simply the uniting of two branches that are each attached to neighboring plants. Where it is intended the union is to be made, the bark, and also a thin slice of the wood (in thickness according to the size of the intended new sort) must be cut away so that the bark on both sides will unite; the two are then brought together, tied, &c., as in the former cases of grafting. There is no advantage in this plan, excepting that it may be performed any time during the summer. It is, however, best to do it immediately after the full expansion of the first leaves, which better insures a perfect adhesion. When it is thought that the union is complete, which ought to be in five or six weeks, the lower part of the introduced branch may be cut half through, and left so while attached to its own parent. In another week, or ten days, it may be entirely severed, and again left a similar length of time, when the head of the dishonored kind may be cut away, and the new one allowed to take its place. Without these latter precautions, there is great danger of failure, as the sap may not have begun to flow freely into the new parts. It should also be observed, that in all the examples, when it is seen that the ligatures begin to grip the bark, from the increase of growth, they

Fig. 29.

should be loosened a trifle, and in a week or two afterwards they may be removed entirely.

Seed.—The preparation for seed, and the after management, may be exactly the same as for eyes; so there is no occasion to give any directions on this head, further than by stating that it should not be buried deeper than half an inch. If there is not the convenience of a hot-bed or hot-house, the hardy kinds may be sown in the beginning of April, in a cold frame, or, where there is no glass accommodation at all, they may be made, with care, to vegetate in the open ground, but not with the same certainty.

The Raising of New Kinds.—New or different varieties of any plant are generally raised from seed; in fact, it may be said that all permanent ones are so. It occasionally, though very rarely, so happens, that a plant will produce a sport in some particular branch, which, if budded or grafted on to other stocks of the same genus, will continue to produce the like from which they were taken. The Tottenham Park Muscat Grape, and Fern-leaved Beech, are examples of this kind; but such sports are not always to be depended on, as they are apt to again produce offshoots like the original parent; consequently we cannot say that they are really permanent, although the return backwards only occasionally occurs; still it is possible, and sometimes is the case.

In varieties raised from seed we very rarely find a change, either in the original plant, or any buds or branches which may be taken from it or from them in after years. Notwithstanding which, there are some species so prone to sport from the seed, that no two will be alike, or exactly similar to the parent from which they were obtained, and the grape-vine is among this class. Without stopping to discuss the question of what is a species, it may be stated

that, when once the apparent fixedness of natural distinctive characters is broken, either by accidental or purposed hybridization, there is no end to the variety that may be produced. So prolific has this variation been in the exotic kinds, that some European catalogues enumerate several hundred sorts; and although many of these are merely duplicates of others, there are still left enough to prove the case. In our country the same is being verified by the many new kinds which are at present being introduced to public notice, and as the community become more awake to the improvement that may be made, we shall have a long array of names, containing in the aggregate all sorts, from fine and good, down to middling and bad; and, in connection with this, we may look forward to a far superior quality to any we now possess; for there is nothing to prevent a progressive movement, or ultimately attaining to the same perfection which the exotics at present possess, with the additional property of a hardy constitution, that will prosper in the open air, without the great drawback of mildew, to which the foreign kinds are so subject, and which consequently renders them worthless for out-door culture, with very few exceptions. So important is this matter as a national profit, that the subject cannot be forwarded or discussed too much. Our own vineyards are now supplying a great part of the home demand; and if the present grape-blight of Europe continues much longer, the making of wine, and the cultivation of the grape, will be so much curtailed there, that it is not unlikely we may become a large exporting nation in this commodity. Taking this view of the subject, all those who may be attempting to improve this valuable boon may be considered as public benefactors, and we introduce what experience we possess for the guidance of those who have not investigated the subject.

Physiological theory teaches, and practical experience proves to us, that the progeny of a plant, the flowers of which have been fertilized by another, is more likely to retain the constitution and habit of the maternal side, while any peculiarities as to flower and fruits of the father are introduced into the same body: consequently, the native kind should be fertilized by the pollen of the exotic, when a hardy vine would most probably be the product, with an approach to the fruit of the foreign sort. So decided is this fact, that the operator may predict tolerably closely what the result will be; and it is as sure as a demonstrated fact, that we can produce, by care and perseverance, by this course, a tribe of grapes suitable for every purpose of the *vigneron*, and also satisfactory to the palate of the most fastidious epicure.

For producing a fine table grape, perhaps no better varieties can be chosen than Isabella, or Concord, fertilized with Black Hamburgh, for a black; and Diana, crossed with Chasselas Fontainebleau, for a light-colored class. For this purpose, it is not advisable to make use of the Frontignans, or Muscats, for the natives have already too much of the musky flavor, and by introducing the sweetness of the Hamburgh and Chasselas, we shall be most likely to produce a Muscat flavor, with the size or beauty of berry, and form of bunch of the two paternal kinds. Beside the production of a fine class of grapes for dessert, this is likely to lead to a quality most suitable for the sweeter and mild-tasted wines; but for those of rougher and fuller flavor, the probability is that the Frontignans would answer the purpose better. This is, however, only conjecture, and must be left to futurity for proof. To insure success, some care and attention is necessary; more will be accomplished with these, from a dozen seedlings, than by a thousand without it. The plants to be operated

upon should be in robust health, neither having at any time shown symptoms of mildew, and the flowers of both selected from fine and well-formed bunches. The operation of fertilizing is also a delicate one, and there is some difficulty in getting the two sorts to bloom at the same time; for the exotic will, almost without exception, have to be under glass; and the native, on account of producing hardiness, should be planted outside. A temporary glass frame to forward the latter would be of service, and the former might be retarded by excluding the light until the buds burst, and keeping the head down in a cold house. The most convenient and certain way is to treat one or more plants of the native kinds as advised for pot culture, and, when the plants are strong enough, to introduce them into a Cold Grapery early in the season, so as to have them in blossom as near as possible to the time of the others which are in the same apartment; and if attention be paid to the applying of liquid manure, there will not need be any doubt of the fruit lacking nourishment. When the hardy sort begins to open its flowers, the stamens should be immediately cut out, and the stigma fertilized by the pollen from the anthers of the exotic; indeed it is necessary, if the greatest surety is intended, that the corolla (which fits like a little cap over the parts, and rolls up from the bottom, instead of, as in most flowers, expanding at the top) should be carefully removed before its natural liberation, for the anthers generally burst just previous to being exposed; and as they encircle the stigma, and are immediately over it, impregnation may have then taken place, which will most likely frustrate all hopes; for any hermaphrodite plant, providing all the sexual organs are perfect, will be more readily fertilized by its own than another's pollen. While the mother plant is in bloom, care must be taken to keep off insects. This may be done, by

tying a fine net-work bag over the bunch, and, if there be a suitable place on the premises for its healthy action, the vine ought to be removed away from any other plant of the same family which may be in bloom at the same time, for the pollen is a very subtle substance, and a proximity to others might destroy all success.

CHAPTER XIII.

DISEASES.

MILDEW.—Nearly all attempts to cultivate the exotic grape-vine in the open air, in the United States, have ended in total failure and disappointment. In a few solitary instances, and under peculiar circumstances, where the excessive changes have been counteracted by shelter or otherwise, a partial success has been obtained, but the climate of the whole eastern and middle parts of the Union, is too variable for its easily checked, though vigorous constitution, and by which the vital energy is impaired at the time of greatest activity—when mildew in its various forms completes the works of destruction. This mildew is the growth of fungoid vegetation, the seeds of which are so small in many kinds as to be invisible to the naked eye. There are two kinds which are most troublesome to the grape-vine—one, which we presume to be the *Oidium Tuckeri*, that is at present devastating the vineyards of Europe; and the other a *Bo'rytis*, or some analogous genus. The first indication of the former is shown by the leaves having brown spots upon them, and which permeate quite through the tissue. Afterwards, are seen small white patches of the soft and delicate fungus attached to the *under* side of the leaf, and which, if not speedily destroyed, will soon extend to the fruit stalks, penetrate to the berries by the rhizoma or spawn, and make them in appearance like a diseased potato in the first stage of infection, stopping their growth, and render-

ing them useless; the leaves also will fall off after a short time, and the whole plant become seriously injured. These white patches are the fructification of the parasite; when viewed under the microscope, there is exhibited a multitudinous congregation of little mushroom-looking substances, and if suddenly jerked, the tiny sporules may be seen detached, and floating in the atmosphere, so minute and subtle, and in such countless numbers, that it is not unreasonable to suppose (beside the immediate development and rapid vegetation of thousands of them under favorable influences) many are absorbed by the stomata or breathing pores on the under surface of the leaves, and conveyed into the interior, simply by the descending movement of the elaborated sap, which is afterwards converted into woody-fibre, and in its turn becomes the organized medium by which the ascending sap, in the following spring, flows with greater velocity to the unfolding leaves. The secreted sporules may then be re-conducted upwards, and conveyed onwards to the foilage, and there remain dormant, until the favorable circumstances occur for their germination, when they spring into renewed life, and speedily produce another crop of seeds for a future generation. This kind of mildew seldom does any mischief after the growth approaches towards ripeness, or the fruit is in the last swell, and as it generally begins to appear about the early part of July, during damp and close weather, those plants which have been more or less forwarded by artificial heat are almost free from its attacks; but in the Cold Grapery or Retarding House we should be on our guard, and when storms or damp weather occurs, strew sulphur on the floor of the house, in the proportion of one pound to each fifteen or twenty square-yards, and withhold water for the time being, keeping the house quite close, if cloudy, and allowing the temperature to rise some-

what higher for two or three days. This will cause the sulphur to throw off fumes, which are readily perceptible to the smell, and will check the further progress of the past if present, or prevent its appearance if not so. We have used all the supposed remedies that we could collect a knowledge of, by way of experiment, without being able to discover anything more than temporary relief, while the fumes of sulphur, as above recommended, have never failed to immediately check, and if water be withheld during the continuance, to finally overcome it. *There need be no fear of sulphur doing harm to the foliage; so long as ignition does not take place, it may be used with confidence.* Herein lies the secret. If allowed to burn, chemical action goes on, and sulphurous acid is produced, which in its then gaseous form will speedily destroy all foliage with which it comes in contact.

The other kind (*Botrytis?*) appears like a fine and delicate hoary mouldiness, and vegetates along the young wood and tender growth of the stem, the leaf stalks, over the surface of the berries, and *upper* side of the leaves; enveloping and covering the parts so as to prevent the further progress of the fruit, cause the leaves to fall, and the branches to cease growing. It is not, as in the previous example, confined to late crops, but will attack those started early also, and is often most prevalent when too dry and cold a temperature has been allowed, more particularly if a strong moist heat has been previously kept up; cold drafts will increase the tendency—hence great caution is necessary in ventilating, or the producing of that atmospheric peculiarity which takes place when the moisture that is in solution in the atmosphere becomes condensed by a sudden transition to a lower temperature. Observation will show that those forms of fungus which attack peas, gooseberries, &c.—and the kind now spoken of is

similiar in structure, if not positively of the same genus—are most prevalent when a slow steady under current of dry air is passing in hot weather, which, by exciting to an extraordinary degree of evaporation, leaves a damp clamminess upon the surface of all plants by drawing out a portion of their collected juices, which then becomes food for the sporules to vegetate upon. This may be considered somewhat similar to the bottom draft in a hot-house—a very different thing, by the way, to a healthy and free ventilation overhead, where the air is made to circulate evenly over the whole cubic bulk, without that continual stream from small apertures below. In our present case, moisture combined with heat will counteract the fungus, and it may be effectually got rid of by syringing with water, in which a portion of sulphur is mixed; one pound of the latter will be enough for ten or fifteen gallons of the former. If the fruit be approaching to maturity, this kind of application will disfigure it, and the same purpose may be as effectually gained by dusting a small quantity on the heating apparatus where it will not ignite; or if a cold house, by strewing it over the floor in the same quantity as before advised.

The peculiar circumstances under which parasitical fungoids luxuriate, are wonderfully dependent on the state of the atmosphere. This is demonstrated, not only by the different sorts of grape mildew, but in all others.

All plants indeed are not alike susceptible to these influences. The constitution of various plants may be able to withstand the effects of atmospheric changes without revulsion or excessive flow of the sap, and therefore they will not afford those precise requirements which favor the germination of the fungi. But as a general rule like causes produce like effects.

It follows, then, if the above observations are correct,

that the main preventive of mildew is to keep the plants in a steady and healthy action, not only by supplying a due proportion of food moisture and heat according to their constitutional requirements, but by preventing sudden changes in the atmosphere with which they are surrounded, and particularly avoiding cold drafts in the lower parts of the house. Heat accelerates the circulation, and if the whole bulk of the air is uniformly heated, the circulation will be equal in its action and distribution in every part of the plant.

In our practice, bottom air is not admitted until the fruit begins to change color. Although the above remarks may not harmonize with the opinions of others, an extensive experience has convinced us of their correctness.

We have then the whole matter in a "nutshell." During the time when the vines are growing freely, keep up a strong steady heat, avoid damp or cold drafts, and south and east winds during cloudy weather or storms; keep the house closed in such cases.

Be careful that the house is not suddenly heated up when the sun breaks out, afterward regulate the moisture according to the external atmosphere. Close early in the evening, and open early in the morning. Observe and remember that to counteract the effects of sudden changes in the atmosphere is the great desideratum. The best of us may sometimes find our utmost skill tested, but a perseverance in the course here marked out with close attention will overcome all difficulties, and we will be amply repaid for all our trouble.

Many think that when mildew makes its appearance sulphur is the only antidote, without anything further than merely dusting the affected parts, or strewing a portion over the floor. From our previous remarks it will be seen, that this will sometimes be sufficient, but it is not merely

the immediate contact, in all cases, that produces the remedial effect. The further spread of the *Botrytis?* may be arrested on particular spots where the sulphur is applied, but it will not suffice for the *Oidium*, for we have seen it push through a thick coating after the application had been repeated for several days together, and we would more forcibly repeat that the fumes emanating from sulphur exposed to a high temperature, are the only radical cure that we have yet discovered.

There are several other sorts of fungi which are seen at times in the grapery, but which are not any further destructive than by extending a mouldiness to the ripe fruit, or decaying leaves or branches, which may be prevented by circulating a free current of air through the house, or if that be not practicable, as sometimes happens with late crops or the Retarding House, by lighting a slow fire, and lifting the top ventilators. This will dry up the moisture, and be beneficial to the vines, by assisting them to ripen better. These last mentioned fungi may be considered as epiphytical, for they feed upon a tendency to decay in the body upon which they vegetate; while the first and dangerous kinds are strictly parasites, which germinate and progress upon the living substance, and destroy the organization of all parts in their course.

Shrivel and Shank.—These two terms may be considered as one disease, only in a more modified or virulent form. The difference being, that when a bunch of grapes is said to *shank*, the whole or a part of it dies off; while in *shrivel*, the footstalks of the berries, individually, are only attacked. The first stage is seen as brown spots on one side of the stem of the bunch, or the footstalk of the berry, and which, if not cut away, soon encircles the whole, the consequence being a certain stop to the circulation, and worthlessness to all parts below. From the earliest time,

there has not been anything in grape culture that has excited more discussion than this disease, and the most eminent and best cultivators have come to diametrically opposite conclusions, according as it has shown itself to their individual observation. In some houses this is the greatest bugbear that the grape grower has to encounter; for after the anxiety of the season appears to be past, and he is looking with pleasing satisfaction on his success, his hopes are suddenly blighted by the instantaneous appearance of this pest. His crop is just arriving at maturity, the berries are fast coloring, well swelled up, and to all appearance safe, when upon close examination, they are found to have become flaccid, the footstalks of the berries or a part of the stems of the bunches are turned brown and withered, in consequence of which the fruit receives no more nourishment, the carbonizing action is arrested, and the affected berries remain intensely sour. One finding that his borders are not well drained, and the roots partly rotted, and seeing no other cause, comes, and with reason, to the conclusion that it is the effect of this, and in his honest belief heralds his opinion to the world; another takes an opposite inference, for his borders are too dry; a third discovers that his house is badly constructed as regards the means of ventilation, or that it is situated too low, producing a stagnant, or unwholesome damp atmosphere; a fourth states as positively that the keeping of the house closed too late in the morning, and the sun's rays striking directly upon the wet or damp footstalks produces the disease; a fifth, that it arises from extremes of heat between the roots and the tops; a sixth, that sudden changes of temperature in the house are the cause, and in this way we might go on enumerating opinions respecting the nuisance. It is a common saying that, "when doctors disagree, who is to decide;" a very sensible ques-

tion, certainly, in this case. After careful study—now for the last twenty-five years—we are led to believe, that anything which arrests, or interferes with the healthful action of the vine at this particular stage will be likely to produce this disease. If we argue from the analogy between the animal and vegetable kingdoms, we know that as immediately before parturition there is a very great stress upon the constitution, requiring all the strength with which the animal is endowed to carry through nature's action—so with plants. As proof of this, when the fruit is taking its last swell, the size in many kinds increases one-third in a very short time, and in some instances with such rapidity that the tender skin is not strong enough to withstand the inward pressure, but bursts open. It is most likely that the change by chemical expansion has something to do with this, and if the plant is not enabled to perform all its functions uninterruptedly, the stalks of the fruit, which are the conductors of the required fluids, do not receive a full supply of the needful elements, but perish from the extraordinary demand that is made upon them for the time being, for we find them only affected in this particular manner at the period mentioned. If this argument be correct, it will be well, when there is a disposition toward the disease, for all grape-growers to ascertain where the deficiency is most likely to be, and remedy it accordingly, without any reference to dogmatical opinions.

In the course of this work, an endeavor has been made to explain all the necessary appliances and conveniences required for successful grape culture, and as in our own practice we are very little troubled in this respect, the advice is given with some confidence, and a belief that if fully carried out the same results will accompany the operations of others. When the injury is done, the only

alternative that remains is to cut away the parts injured, and remove them immediately from the house, and insure the prevention of any contamination to those which are healthy.

Dry Rot in the Roots. The upper indications of this disease are flaccidity, and deficiency of solidity, accompanied by a sickly yellowish color of the foliage, weak growth of the branches and paucity of fruit; a prolonged increase of the malady will at length cause the vine to die, and that most commonly about the time when the berries are half grown. All this arises from the want of nourishment from the roots, which, if examined, will be found to be rotted, and often covered by a mouldiness or fungus. There is no doubt but the primitive cause of this affection is a check to constitutional vigor; and extremely close summer pruning has much to do with it, as it prevents the plant from equalizing its expansive and centralizing powers, thereby keeping up a perpetual excitement through the vessels, which at last brings on an enfeebled condition. When a vine becomes affected in this way the best plan is to take it out, renew the soil in the immediate vicinity, and afterwards plant another in the same place, for it is seldom that the diseased one does any more good.

The roots sometimes become rotted from other causes, such as being too deep under the surface, or when the borders are very retentive of moisture, or composed of over-much undecomposed materials, &c. For this there is a remedy if taken in time, and the best thing to be done is to thoroughly drain, if that only is the mischief, but if it be from the other sources mentioned, the roots will require to be lifted, and the operation needs great care; so soon as the leaves fall, proceed to uncover them; trace each one, and as they are respectively liberated lay them in a straight length until all are secured, after which they

ought to be wrapped in a damp mat or cloth, the border thoroughly trenched over, and a thin layer of good turfy loam put on the top, when the roots may be again spread over the surface; all the decayed parts cut away with a sharp knife, and covered by four or five inches of the same kind of earth that was put under them. Care must be taken however before winter sets in, that a good layer of tree leaves, or weak littery dung be spread over, to keep out the frost. There have been many examples, when this has been skilfully attended to, where a stock of vines have been entirely rejuvenated, that were previously worthless and thought to be worn out, but which have afterwards borne good crops of fine fruit for many years. It is necessary to give a partial shade in the early part of the following summer, or until the leaves get pretty well expanded, and it is better not to let them carry much, if any, fruit during the first year after the operation. Cloudy or damp weather is the best time for removing, and the roots should be as little time as possible out of the ground.

Rot in the Fruit.—This has of late years caused considerable loss in the cultivation of vineyards. It generally shows itself at the time when the fruit begins to "stone," after continued wet weather, followed by bright sunshine, when the berries become discolored and fall off. All the symptoms of this disease go to prove that it is the result of the plants imbibing too much moisture at the time when nature could better do with a reduction of it, for the grape-vine at this stage of growth would be considerably benefited if no rain were to fall during the after part of the season. Seeing this to be the case, we ought, so far as circumstances will allow, to try and remedy the evil by the choosing of a situation that is open and airy, but not exposed to the violence of storms—a free porous subsoil,

or efficient drainage; thorough and deep trenching or subsoil plowing, and not over-close planting, so that the air may pass freely between and among the plants, in order the better to drive off all superabundant atmospheric moisture, and also enable the plants to exhale the overplus fluids with which, at such times, they are surcharged. For the same reason, where the vines are trained over arbors, or on trellises, the branches ought not to be too close, or the summer growth to become crowded. This object is not to be gained, however, by plucking off the leaves as some persons very ignorantly do, but by attentive disbudding of all those shoots that will not be actually wanted, in the early part of the season, or so soon as it can be plainly seen which branches will produce the finest fruit, and by laying them in, at pruning time, sufficiently distant—eighteen inches is near enough. In the grapery we are not much troubled by this nuisance, except in damp, ill-ventilated, or badly-glazed houses, which is another proof that the cause is an excess of moisture, for it is a common practice, when the fruit begins to color, to use very little or no water in any form, consequently at the critical period the grapes are in a drier atmosphere and the absorbing foliage is prevented from inhaling any more moisture than is necessary to suppport health. Where the vines are planted and the fruit is found to be subject to the affection, it will be well to drain deeply between the rows in the fall, and when the ground is forked over to apply a good dressing of fresh powdered lime; indeed a very confident opinion will not be much hazarded by stating, that a well drained calcareous soil, in an airy but not exposed situation, would be sure to give grapes nearly, if not quite free from rot.

Spot.—The spot, although by some persons confounded with the preceding disease, is certainly a different thing;

it is not so injurious, as the berries only become marked by a black spot on the surface, (but which penetrates through the skin), and remains on the vine to ripen; the quality, however, is considerably deteriorated, for it continues to be a "spot" to the last, and gives a bitter taste to the flavor, not only for table use, but also to the wine which may be made from the affected fruit. After some years of careful watching for the cause of this, we are led to the conclusion that it is produced by the direct striking of the heat of a midsummer sun immediately upon the berries, after heavy rain, the individual drops of which fall with great force, and knock clear off a spot of the "bloom" or farina that the berries are covered with, and which, no doubt, is a protection against its intensity, thereby leaving the tender cuticle exposed, and subject to be more readily acted upon, just the same as the concentrated focus of a burning glass, on a previously covered and delicate skin would be, if it were to be acted upon in the same way. With this paralizing action upon the particular parts, they are more easily attacked by a fungus, which, when once it becomes established, will progress so long as the same weather continues, and hence is explained how the disease increases with a similarity of circumstances, and likewise the cause of its cessation.

There are several trifling matters connected with the subject, which may not be considered as disease, that may be traced to some of the causes previously mentioned, but which if carefully observed may be remedied in time, without permanent injury; and in connection with this it may be mentioned, that although it has been recommended to keep up a moist atmosphere with repeated syringing, it is by no means to be inferred that it is intended to water *overhead* in the middle of the day, or yet in the morning unless very early. In such a climate of "grey sunlight"

as that of England, there will not be much harm done by such a practice; but with our "bright and sunny skies," the same practice will lead to scald and to brown spots on the tender bark and under side of the young leaves, thereby interrupting, to a certain extent, the luxuriant and free development, and sometimes will entirely check the elongation of the branches, which causes a revulsion of the sap, and, of course, injury to the whole body.

CHAPTER XIV.

INSECTS, AND HOW TO DESTROY THEM.

WHERE the treatment described in the foregoing pages has been adhered to, there will be little trouble with insects in the late grapery, but in early forced houses, with the most careful watchfulness, they sometimes make their appearance during the middle and after part of summer; also in the vineyard and all out-door culture of the grape, either one kind or other will, at times, commit great ravages, or do much mischief if they be not speedily destroyed; and "prevention is better than cure," was never more *apropos* than in this case, for if a plant of any kind is suffered to remain infested with these pests, you may bid good-bye to health or productiveness. Therefore be on the look out, and when the enemy shows his advance guard, rest assured that if not speedily routed, a numerous army will follow. Attack his outposts, carry war into his centre, destroy his flank and rear, and completely annihilate him, or you will find that he will continue to give annoyance. Give him no quarter, for he keeps no truce, and so long as he has one helpmate of the opposite sex, he will persevere in bringing up his myriads of offspring, which are soon ready for active operation and renewed destruction.

The insects which attack our present subject, are red spider *(acarus,)* several species of *coccus*, as brown turtle, and white scaly bug, mealy bug, brown and white

tortoise-shell scale, black and green fly, *(aphis,)* thrips, fretters *(cycadæ,)* three or four kinds of beetles, as the rose bug, cockchafer, &c., and occasionally the caterpillars of some moths.

The *red spider* is a very small, dark red insect, almost invisible to the naked eye, which locates on the under side of the leaves; it delights in a dry, hot atmosphere, and if left long unmolested, will spread over the whole house, spinning a delicate network, among which it travels with the greatest facility, feeding upon, poisoning, and disfiguring the plant. It may be destroyed by syringing and a damp air, and can be completely eradicated by the use of sulphur, used as advised for mildew. Indeed it is doubtful if it will exist at all if sulphur be exposed occasionally to a high temperature, *without being ignited.* The writer applies it at times in his plant houses, and is never troubled with either red spider or mildew; even among roses when forcing in the winter, and the only trouble is, to sprinkle a small quantity over the hot water pipes, or coolest end of the flues, three or four times during the season. If proper use be made of the syringe, the sulphur will not always be required, but when applied it answers the double purpose of preventing the spread of both red spider and mildew.

The different species of *scaly* and *mealy bugs* may be destroyed by the preparation recommended for the vines as the wash to be used in the fall, page 65. The scales generally adhere to the bark, and the brown ones are often so near the color of it as to require a close look to see them; here they stick, sucking the juices, and ejecting their sugary excrescence, which spreads over the leaves, and stops up the breathing pores The *mealy bug* is to be found in the crevices between the bark, in the joints, and among the bunches, in the form of little cottony-looking

substances, in which case it should be taken out with a small brush or pointed stick, for if left in its lurking places, the bunches among which it is located will be disfigured and too dirty for use. The *tortoise-shell scale* is more solitary in habits, and in appearance like a small tortoise-shell; it is to be found in the same places as the brown scale, lives upon the juices of the vine, and can be destroyed by the same means. *Aphidæ*, or green and black fly, are small insects, sluggish in movement, having prominent antennæ, a large abdomen, and a long proboscis, with which they pierce the cuticle of the tender shoots, and draw out the sap, which quickly brings decrepitude into the advancing extremities. They are viviparous and gregarious, and increase amazingly fast.

Thrips are small, active, linear-shaped little insects, which congregate on and run over the under surface of the leaves, disfiguring them, and eating the epidermis or outer covering; and the *fretters* (a species of *cycadæ*) move by short flights, or rather jumps when disturbed; they are somewhat linear and triangular in form, small, and of a palish yellow color, and like the last they feed on the outer covering of the leaves. All the last three varieties can be destroyed by fumigating with tobacco, but care should be used in the operation, so as not to apply too much while the leaves are young and tender, for in that state they are soon injured.

The *rose bug* is a lightish brown little beetle, with a small head, and long proboscis. In some parts of the country it is very destructive to hardy grape-vines, before and about the time of blossoming. It congregates through the day-time often in great numbers, and eats the tender flower stems, thus destroying all future prospects for the season. The most effectual way of keeping this troublesome customer in check, is by hand-picking, at inter-

vals through the day, more particularly early in the morning, for although it may be caught at any time when at rest upon a plant, it is more sluggish before the heat of the day commences. Being only the visitor of a period, annually, a careful watching for three or four weeks is requisite at this time, after which it disappears, and is no more trouble. The *cackchafer beetles* are larger, more oval in form than the foregoing, and of several colors; they attack the leaves and young shoots through the season, but are not so destructive. The same process (hand-picking) will have to be resorted to for their destruction. There are also several kinds of the larvæ of *humming bird moths* that occasionally feed upon the young stems, and edges of the leaves, and which, being so near the color of the parts they feed upon, and cylindrical in form, are somewhat difficult to find; consequently when it is seen that injury is being done, a sharp look-out ought to be practised, and a quick eye will soon get accustomed to the detection of these, and any other kind of caterpillars that occasionally may be annoying. And here we may state that the best advice which can be given in this matter in a general way is, to remember the old saying, that a "stitch in time saves nine;" and if we do not wish to cultivate our destructive propensities, by having to destroy an immensity in number of God's links in creation, we ought to have a benevolent feeling, and recollect that the earliest and first onslaught upon the precocious subject will render unnecessary the putting to death of countless myriads afterward, each of which, in the true sense of reason, has as good a right to live as ourselves.

With regard to the grapery under glass, if the insect world is "legion," and the generations quick in succession, they are easily kept down, and nothing but gross negligence or ignorance will permit them to get ahead. Use

water freely during the earlier periods of growth, drive it into all crevices of the house, and judiciously over the vines, and you may generally defy all the host of them. If after the fruit begins to ripen they should make an attack, the sulphur and tobacco may be applied as recommended, when their comparatively small numbers will be speedily put to the rout.

CHAPTER XV.

THE VINEYARD, AND OUT-DOOR CULTURE.

So far, the grape-vine has been treated of in a general way, as regards the natural disposition of the various kinds in cultivation. The practical details also are more particularly explained for the treatment of the exotics, but to make a clean breast of our present business, there is required some more notice of the natives, and out-door culture. If we could be satisfied with a stand-still position the thing might remain as it is, for almost everybody who has a yard of land thinks of a grape-vine; and yet a greater number know how to grow grapes, if we are to believe the many metaphysical conversations that often take place. The fact is, that all the species and varieties will more or less prosper with almost any kind of treatment, providing they be in a suitable climate; but this does not argue against the best cultivation, and there is little fear of contradiction when the statement is made that skill and care will be as amply repaid with any or all of the kinds. It matters not whether for wine or table use, this still holds good, and the only difference is in what is required. If, for instance, the produce be intended for wine, it will be necessary to combine, as much as possible, those peculiar characteristics which the best samples are found to possess, and in such case it is not advisable to introduce too much stimulating matter to the roots, but let nature have her way, with help directed towards her own

course, and still further to make use of those varieties that contain within their original structure more than usual of those ingredients which are suitable for the purpose. Now generally, *with due maturity*, there is enough of the carbonaceous property, that can, by the plant's own action, be converted into sugar, and of course by proper fermentation a sufficient proportion of the alcoholic principle may be obtained; but this does not give the particular nor yet the varied aroma for which some wines are so prized. Too much encouragament to the production of exterior development delays the formation of concentrated sugary matter, and those constituent properties which are derived from hydrogen and other gases, that form in the exact proportion those very desirable accompaniments which connoisseurs delight in. Consequently it is easily seen that moderate growth, with efficient drainage; must be the best, and that as these peculiar properties are invariably more highly concentrated under the influence of light and free air, ample space is essential to vineyard culture. Although our country is said to be "the land of the vine," it by no means follows that we may plant with impunity in any situation, or under any circumstances, and notwithstanding it is found that some varieties grow even in swamp land, and produce fine fruit withal, when left to ramble among the branches and overtop the loftiest neighboring trees, if we try the same in culture for wine purposes, it would in the greatest number of cases be nothing but a miserable failure; firstly, on account of deficiency in the quality of fruit; and secondly, there would be no certainty of it becoming ripe, from the liability to the rot. On the other hand, the locality may be in all respects suitable, but yet so exposed to violent storms, that the foliage may be injured and torn to the detriment of both fruit and plant, and therefore such should not be made choice of. Again,

some caution should be exercised with regard to those aspects which lie open to the winds that bring with them the damp and fogs of summer; consequently, it is objectionable to choose a slope toward the sea. Each tract of country has its own peculiarities, and an acquaintance with the neighborhood will enable any observant mind to decide in this particular. There is no advantage in following to the letter the advice of those who, too often, persist in believing a south-east slope to be imperatively necessary—men who may have prospered well enough in their own country and climate, are sometimes wedded to a certain faith, and have not always sufficient tractability of mind to alter their practice or adapt it to a difference of circumstances. If we consider that along the eastern shores the damp air which is brought from the ocean almost invariably brings on a tendency to mildew and rot, it is evident that in such a region it would be much better to adopt a spot which is sheltered by higher ground on the eastern side. At the same time, a low or moist situation should by all means be avoided, or one where the air is liable to be stagnant at times. The next most important item is a dry under base; a rough rubbly gravel subsoil, with a continued descent below, will generally prove naturally well-drained, but in all examples to the contrary it ought to be made so by artificial means.

Nothing conduces more to prosperity than a soil strongly impregnated with carbonate of lime, or having limestone rock beneath. If any body is sceptical in this, they may be easily convinced by referring to analysis, or more simply by examining the incrustation left on the edges of the leaves after the evaporation of that excessive perspiration, which sometimes takes place in hot and cloudy weather, while the growth of the plant is young. There is perhaps no plant which exhibits more clearly than does

the grape-vine, the oft-disputed fact that these inorganic substances are really absorbed. Here is a plain proof that they are, for according to the greater or less amount of lime in the soil, so will this appearance be manifest. It is most likely, that if all plants were so situated as to be enabled to take up the exact proportions of the various elementary food required by them, most of the diseases to which they are subject would disappear; and certain enough it is, that *all* would be prevented, if we could control the elements to suit the different stages of growth, and adapt the light and heat to all respective constitutions.

In making choice of a piece of land for a vineyard, it is not always convenient to gain possession of the precise spot which our intelligence would covet; but if it could be done, and there are many opportunities where it may be, we should accept an elevated table-land, lying high and dry upon a limestone base, and screened from the damp easterly and cold north and north-west winds by a distant range of hills, which would protect without producing a confined atmosphere, and give shelter against the most frigid blasts of a below zero temperature.

We may also take a more philosophical view of the method of planting than is generally practised, and instead of fixing the plants in the position of so many hills of corn, and about the same distance apart, when each stool requires a stake, and the bearing cane has to be curved over, thereby being only half supported, we would consider the aspect that might have to be dealt with, the inclination towards the sun's rays, and all such matters as would give opportunity for the most prevalent drying winds to blow through each row of vines, and in addition to expose the upper side of the leaves as much as possible to the action of the mid-day sun, in order the better to concentrate true growth, and prepare the plants to resist

the violent and sudden changes of weather for which our climate is so proverbial. The following explanation will perhaps show more clearly what is here meant. After making choice of a suitable soil and situation, and making sure that the subsoil is well drained, commence to trench with the spade, or plough deeply the whole piece. If the spade be used and the soil shallow, this operation may be performed as follows: Take out a trench at one side, three feet wide and one spit deep; wheel or cart this to the other end, then loosen up the under soil another spit, break it up well and leave it in the bottom; throw the next upper crust on the top of this, and so on until all is finished. Where a large extent is to be cultivated, it would become too expensive to trench, and the plough will have to do the work; in which case, the subsoil plough ought to follow the top loosening. Where the soil is equally good the two spit deep, the bottom may be turned to the top to advantage. Very little manure will be needed if the earth be in good heart, and well incorporated with vegetable matter, but otherwise it is advisable to work in at the same time, from ten to fifteen tons of decomposed barn-yard dung to the acre; and if there be a deficiency of the alkaline bases, a dressing of lime and wood ashes will prove very beneficial. Although the roots of the grape vine, when established delight in an open turfy soil, a cross ploughing and harrowing will be required to pulverize, sufficiently, the soil before planting, and give the young fibres a better chance to lay hold of it at first start. The work, also, ought to be done during the summer or previous early fall, so as to get into good condition by the time it may be wanted.

There are many cultivators who think it absolutely necessary to choose a side-hill situation for the vineyard, and it must be admitted that such is often the best, but

there is no reason why it should be invariably accepted to the entire exclusion of any other. However, where the disposition leads that way, and all the above-mentioned considerations are not to be acquired, it will answer the purpose, and if the slope be anything like steep, the whole extent will have to be formed into terraces. This becomes more or less expensive according to the angle of ascent. It should also be remembered, that on a hill-side, the cold air, more particularly in the night, is constantly moving along the surface, from the top towards the bottom, thereby preventing that health-producing evaporation of warmth from the soil which is obtained from the solar heat of the previous day, and causing, in our extreme climate, a condensation of the moisture as it radiates upwards, which is then carried along towards the lowest level in the form of a damp and cold draft among the under parts of the plants; and it does not require a second thought to understand how injurious such a circumstance is in all other kinds of culture. No doubt many will think that such notions as these are not worthy of consideration, but as we are being troubled with rot, mildew, and other hurtful affections, it is well to guard against all things that are likely to provoke, or produce the evil, and avoid them accordingly. Arguing from the culture of the grape-vine, or any other plant under glass, we know that such action would bring on these very diseases; and it is not to inside cultivation alone that we are at all times dependent for proof, for there now and then happens an example where a plant is trained on two aspects, or the head is in different positions, when one part is quite free from disease, while the other is badly affected; and it is just possible that these cold currents of damp air is one of the causes of mischief.

To prepare a side-hill for a vineyard, it will be requisite

to form terraces from the bottom upwards, in width according to the steepness of ascent. If very abrupt, only one row of vines can be accommodated on each, but with a more gentle inclination the breadth may be sufficient for two or even three rows. The front will also require to be banked up to render the upper surface level, and there is nothing more suitable for the purpose than thick turfs of grass-sod, fixed on the edges, inclining from the perpendicular towards the bank. Generally speaking, these sods may be cut from the immediate surface, when a portion of each length to be laid out will furnish enough material for its own front, and as there is a right and a wrong in this operation, like most other things, it may be of service to show the right. When a bank of this character is made of square sods, as seen in Fig. 30, they are subject to give way during the rains of the first summer, from the fact of there being no mechanical holdfast. Fig. 31

Fig. 30.

Fig. 31.

shows how this may be obviated, and the trouble or expense of workmanship is the same in both cases. The way to get these latter is, to simply cut down a few inches with the spade in a slanting direction, by a straight line at equal distances, as much as may be wanted, and afterward cut to the same width, with the line placed diagonally to the first cutting, which will give each individual sod of the right size and form to push together, by merely reversing the bevelled edge at each rise on the height. The trenching, plowing, manuring, &c., will be the same in this as the before-noticed plan. The next thing to be

done, is the preparing of supports upon which to train the vines.

The most common method of planting is, in straight rows from five to six feet apart, and at right angles with each other, and to simply have a pole to each vine; the method of training being the long rod, explained page 120. This answers the purpose very well and has become the most customary, in part from the introduced routine of Europe, and in some measure as a consideration of economy. As to the latter, there may be some saving to the pocket, but unless there are more than counterbalancing advantages, there is no use in following old customs, so long as better ones can be introduced, and in the present case, an improvement may be accomplished by cheap trellises, which may be made in the following manner: Prepare a quantity of good strong poles of locust, chestnut, oak, or ash, seven feet six inches; point and char these three feet on the lower end and drive them into the ground two feet six inches, in rows six feet apart, extending east and west, or as near these points as may be practicable, and the poles nine feet assunder; next fix horizontally long narrow strips of wood, or straight but thin saplings, to the uprights, at a distance of one foot; this will make a substantial trellis on which to train the vines, and be far superior, with very little more expense than the pole-to-one-vine that is so often made use of. It is high time for us to adopt a principle of neatness combined with utility, and endeavor to supersede all such primitive machinery. If we are to imitate, let it not be a retrograde movement, but onward progress; and a still further improvement might be introduced in the trellis recommended, by using galvanized iron wire for the horizontal supports. There is some prejudice existing against the use of wire as it has been thought that it does injury

to the vines by the rusting and their friction against so hard a material, but practically we do not find it so. Let the superintendent only attend to his duty without nursing his old prejudices, and see to the proper tying, and our word for it, there will be no more detriment in wire than anything else. However, let everybody go along as he thinks best, only move onward, and as we are a great, and daily becoming a greater nation, let us not disappoint the expectations of the world by our want of originality.

All may now be considered as ready for planting, and here again we have many notions to contend with. Cuttings—one-year old, two-year old, and even three-year old plants, have each been considered as the best, according to the whims and fancies of pedantry. The fact is, we want a healthy start, at the least expense; and as the plants must have a length of time to become profitable, what can be more economical, or insure future success better, than good one year vines? The more than half part of this business depends on previous preparation; but, as this costs money, it is well, at the same time, to be getting ready the future occupants; consequently it is good advice to say: raise the plants on one spot, and be preparing on the main superficial area; or, if it be not convenient to propagate, adapt all contingencies so as to make sure of after results.

A young and well-rooted plant will, if properly managed and attended, produce a greater growth than a stunted older one, with the additional advantage of being alike in all its parts; what is true individually, will be so collectively, over the whole vineyard, and a greater uniformity will be obtained. In transplanting, take care that the roots are lifted carefully, and removed to their new quarters, before they become dried; nothing produces more evil to any plant than this often careless practice. Roots

are organized beings, containing fluid matter, and intended to convey most of the nutriment upward to the whole superstructure; and if their tender cells become shrivelled, they are not capable of again performing their offices with the same degree of energy, but remain comparatively inactive for a length of time, or die immediately. If the top languishes, a weak start is the consequence, with perhaps the loss of a whole season.

If the trellis be accepted, the rows may be six feet apart, and the plants four feet asunder; but, in the ordinary way of staking, five feet each way will be the nearest possible distance. In putting down the roots, dig a hole six inches deep, and wide enough for them to be spread out all around; cover carefully with well pulverized soil; cut off the head to two or three good eyes; and, when the vines begin to start, mulch over, so far as the roots extend, with rotted barn-yard manure; or, if that cannot be had, then with any vegetable refuse, that is free from seeds, that may be at hand.

When the shoots begin to elongate somewhat, it will be seen which is going to be the strongest, and all the others may be rubbed off. As this continues to grow, tie it up to the stake or trellis, pinch out the laterals (the small side-shoots which grow at the base of each leaf) to one eye, as they are produced, and rub off all superfluous suckers or branches. Nothing further will be required than to keep the ground free from weeds, by hoeing, or the plough, through the summer. The long-rod method of training is one of the best for the vineyard, but a periodical extension is still better, as it is more in accordance with the constitutional powers of the grape-vine, more particularly the strong, growing natives, and alike applicable to all the varieties. Here is one of the greatest advantages of the trellis *versus* the pole method, as with the latter no greater

bulk of plant than is acquired after the third year is practicable. A reference to the chapter on pruning will explain all respecting this part; so there is no use in pursuing the subject further, excepting to state that cleanliness is one of the first demands of the vineyard, and is sure to more than repay for the invested labor.

The training over arbors, around dwellings, and all such positions, will require the same fundamental culture that has been explained for the vineyard, the only difference being in the peculiar desires or fancy of the cultivator with regard to the form of the plant. As the grapevine is so lavish with its embracing arms, they may be entwined around or over anything that will give them support; the whole plant will continue to delight the eye with its beauty, and gratify the palate with its luscious sweets, if kindly treated. Even with worse than carelessness, we may enjoy a portion of its liberality; but, according as kindness is bestowed, so may we expect to meet with an abundant gratitude; for, like the *better* part of humanity, it can appreciate, and will fully return former benevolence.

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